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Switchgear and Safety

ANALYSIS of the electrical accidents reportable during 1935 under the Factory and Workshop Acts, which were summarised last week, reveals the disquieting fact that switchgear was responsible for the largest increase, and the greatest number, of the mishaps recorded.

The position, particularly in the power supply section of the industry, is officially regarded with some anxiety, and the report accordingly devotes more space than has been usual to the detailed consideration of this class of control apparatus. It points out that, although a great deal of money is reported to have been spent on switchgear replacement, serious failures continue to occur, and it is not always the older gear which is involved.

The inspectors believe that it is not generally realised that in making circuit the initial current rush may rise to two-and-a-half times the breaking current when interruption takes place under similar circumstances. They do not find it reassuring to continue encountering cases in which the maximum short-circuit input is unknown to those responsible for operation.

A disturbing feature of two serious explosions, due to sustained arcing, was the fact that failure occurred when breaking short-circuit kVA input well within the assigned rupturing capacity rating of the switch concerned. The complex factors involved in this sort of failure are being actively investigated, but meanwhile attention has been drawn to another risk which attends the closing of breakers—by hand—on short-circuits of a magnitude within the makers' rating.

Hand operation introduces a variable factor that cannot very well be allowed for in design. It was one of the several pertinent questions of control raised in Mr. J. R. Cowie's recent address as president of the Association of Mining Electrical Engineers. The rupturing capacities now becoming necessary due to system interconnection make it physically impossible in some cases unhesitatingly to close a circuit-breaker of the larger sizes now commonly in use by hand.

If the designed contact-making speed is not properly maintained the ability of the switch successfully to perform its duty will be reduced, and it therefore seems desirable to limit the size which may safely be hand-operated, or to take some other not less adequate precaution. Remote control certainly minimises the risk to operators, but does not afford any protection to others who may be in the vicinity. The report suggests that automatic forms of spring reclosing devices are worthy of careful consideration.

The most common cause of failure is the under-rating of switchgear, but nine cases are cited in which timely overhaul should have exposed defects. Indeed, the inspectors complain of the far too general failure on the part of users, especially industrial, to appreciate the folly of not keeping equipment in reasonable order and safe condition.

They even go so far as to assert that "in many places" competence, as distinct from diligence, is suspect, and the report counsels factory occupiers who have insufficient work for full-time maintenance staffs to entrust their contractors with the inspection of apparatus in use as well as its repair when it goes wrong.

Apropos of these observations, the report again comments upon inspectors' constant endeavours to secure adequate space and working room for electrical apparatus, and quotes Mr. H. R. Taunton's article in the ELECTRICAL REVIEW of August 30th, 1935. Not only is the greatest difficulty often encountered by inspectors in dealing with cases in which there is literally no more room available, but, we might add, that in what is to be one of London's largest and most important buildings there seems to have been lack of foresight in this direction too.

The Third World Power Conference

WHEN the World Power Conference assembles at Washington a month hence it will count amongst its delegates a very strong and distinguished contingent from this country. It will be the third of such gatherings, will meet simultaneously with the Congress on Large Dams, and the proceedings promise to be certainly not less valuable than on previous occasions. The foresight of those responsible for the original conception of such a world interchange of thought does not command less admiration as time passes. The late Mr. D. N. Dunlop was the founder, and B.E.A.M.A. gave him a free hand to make his conception an accomplished fact. The first conference took place at Wembley in 1924, with Lord Derby as president, and the second in Berlin in 1930, presided over by Dr. Oskar von Miller.

Our Delegates

THE names of the British delegates to Washington are published on page 176 of this issue of the ELECTRICAL REVIEW. The Prime Minister's nominations include Viscount Falmouth (leader of the delegation, who is prominently identified with public utility matters and is an ex-president of E.D.A.); Sir Archibald Page, chairman of the Central Electricity Board; Mr. J. M. Kennedy, one of the Electricity Commissioners and president of the I.E.E.; Mr. C. Rodgers, of B.E.A.M.A.; and Mr. E. T. Williams, Assistant Director of Electrical Engineering to the Admiralty, and an original thinker on our own national electricity supply organisation questions. Amongst the sixty-four members are many well-known personalities from the electricity supply and electrical manufacturing interests; the women's electrical movement; also from railway, gas, fuel research and other pursuits.

Exchange of Experience

THE programme includes many papers dealing with various aspects of national power economy, constituting, as on previous occasions, an encyclopædia of valuable information. The place of power in the modern world and the certainty of its increasing influence upon our future civilisation and general development in all countries, afford the fullest possible justification for the holding of such a conference. September 11th will be a day of special interest, because the joint session will be addressed by President Roosevelt and social felicitations at the White House will follow. Round-table interchange of knowledge and experience by experts, and study-tours of Canadian and American power undertakings and projects, cannot fail to enrich the minds of our delegates and render them better qualified than ever to ensure the development of Britain's electrical power and engineering on the most up-to-date and efficient lines. Our own leadership, as the result of recent years of practical experience of national electricity supply organisation, will, on the other hand, have enabled them to assist those who are confronted with special power problems in other lands.

American Power Policy

THE activities of Mr. Roosevelt's administration in the field of electric power during the past three years or more make it peculiarly appropriate that the President should address the World Power Conference. He will be able to refer to some remarkable achievements, as well as some projects which have failed to come to fruition. Among the first class he will take justifiable credit for the Tennessee Valley and Boulder Dam schemes; the latter represents an expenditure of $165 millions, and will probably commence to supply power during the period of the Conference. In the second group he will have to mention the Passamaquoddy Bay development, for which Congress has just declined to vote any more funds. Already about $7 millions has been sunk in this scheme, which, as our Canadian correspondent mentioned in our last issue, was originally to be an American-Canadian joint undertaking. According to the *Times* New York correspondent, Mr. Roosevelt, during his meeting with Lord Tweedsmuir, Governor-General of Canada, last week, was to discuss the joint development of hydro-electric power by the two countries.

Securing Wayleaves

IN the preliminaries to the erection of an overhead line in a rural area the wayleave officer plays an important part, and his task is not always a simple one. In the course of his duties he meets all kinds of people, with a variety of ideas, but practically all of whom are agreed on one point: that they will not permit the erection of a pole upon, or the passing of a line over, their property without more than adequate compensation. It is the aim of the wayleave officer to reconcile his duty to his authority with a desire to please those whose farms and fields are on the route of the proposed line. They are often potential consumers and must not be prejudiced against electricity; but at the same time they must not be allowed to claim a rental equal to the annual value of their property. Thus the wayleave officer has to combine tact with firmness, and in addition has to be a bit of a lawyer. One of these officials contributes a few notes on his job to this issue. These indicate the nature of the work and contain some useful hints.

National Lighting Campaign

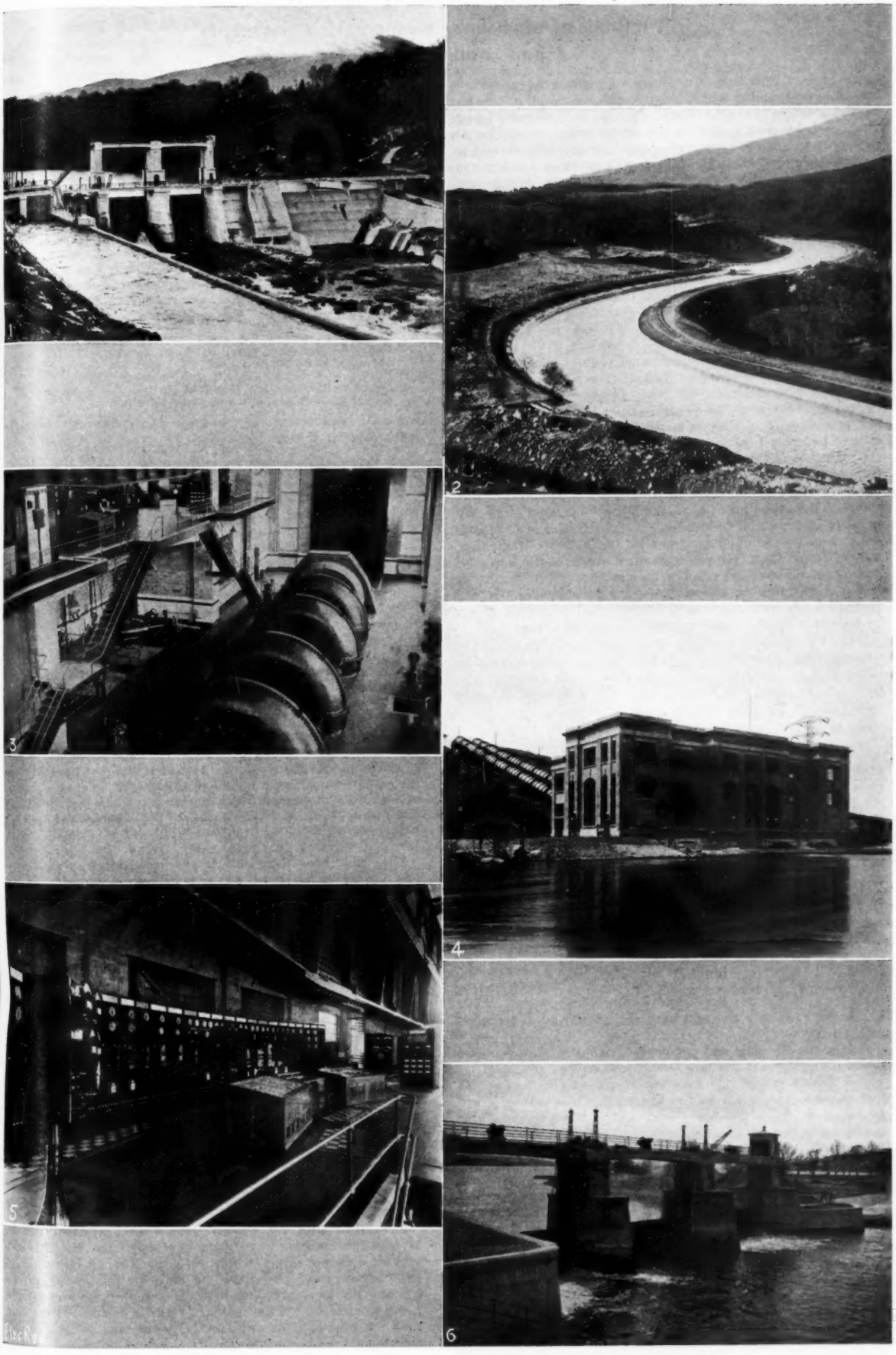
E.D.A. and E.L.M.A. are preparing a joint better-lighting campaign for October and November next. A preliminary programme just issued from 2, Savoy Hill, explains that its purpose is to increase the consciousness of existing lighting consumers that better light means preservation of eyesight and better health. The co-operation of four thousand qualified opticians will stress the urgency of the slogan "Better Light—Better Sight" from their shop windows, E.D.A. will organise conferences in the areas, and suitable window display details are to be available shortly. Publicity on the subject in the national Press will naturally form an important part of the campaign, of which a complete programme will appear in September. Like all efforts to raise the general standard of illumination and prevent eye-strain and its many evil consequences, this effort of electric lamp and supply interests merits the enthusiastic support of all in a position to contribute to its success.

Electricity in Jerusalem

THE speech delivered by Mr. W. Shearer, the chairman, at last week's annual meeting of the Jerusalem Electric and Public Service Corporation, Ltd., was almost unexpectedly reassuring. He said that the company's property had, so far, passed through the Palestine disturbances practically unscathed, although naturally the revenue had been affected somewhat. And yet the inevitable losses caused by the closing of business houses have been practically offset by the greater use of electricity for public lighting and other purposes. The fact that the £1 ordinary shares stand at about 35s., although the dividend is only 5 per cent., is sufficient evidence of the confidence placed in the company's present position and future prospects.

A Penny a Week

FOR little more than a penny per week (5s. per annum) consumers in Newcastle-under-Lyme can now hire an electric cooker and for a similar amount a wash-boiler is obtainable; for 10s. yearly a water-heater may be hired. We do not know of any other authority that offers such low rates, and the fact that a "small" undertaking (with a yearly output less than 10 million kWh) is financially able to take this step and is enterprising enough to do so indicates that there may be progress without amalgamation.



Points of Interest in the Grampian Scheme. **(See page 173)**

1. The Dunalastair dam from the downstream side. 2. View of the three-mile long aqueduct. 3. The turbine room at Tummel Bridge. 4. The Tummel Bridge power station and pipe line. 5. The control board. 6. The control weir at Loch Rannoch outlet.

Wayleave Considerations. By R. S.

Methods of approach, compensation payments and some legal points

IT is unnecessary to outline the various arguments and methods of obtaining wayleaves from more or less reluctant landowners. Unless a representative possesses that quality which can reassure the timid, no amount of instruction will avail. Where difficulty is anticipated or encountered it is good tactics for the representative to explain his proposals and at the same time flatter the grantor's conceit by asking him if he has anything to suggest in the way of practical improvements to the scheme which might appeal to the company's engineers. Unless he agrees outright this offers the Construction Department the opportunity of meeting a potential objector on site and coming to a working agreement. It can then be explained that equal consideration has been given to the interests of occupier and company alike, having regard to statutory requirements, *e.g.*, fixtures have been designed to miss trees and working fields, and so on. It is also thus definitely ascertained whether the grantor is open to reason, or, alternatively, that a compulsory wayleave must be sought or the lands missed entirely.

The alternative of offering increased rentals or using threats of appeal to the Minister of Transport are usually futile at this stage, since farmers are well aware that the Minister cannot award rentals or compensations, and that they have fair prospects of obtaining favourable rulings at the second inquiry before a local surveyor.

Unfairness is the cause of much wayleave difficulty. Experience shows, and statistics prove, that 90 per cent. of consents are willingly given, but that on every extension of appreciable magnitude there is at least one landowner who will insist on preferential treatment. Ultimately this will be conceded leaving the obliging grantors dissatisfied. To be fair, rentals should then be made uniform throughout the line; this gesture would at once prejudice the grantors in the company's favour during the ensuing negotiations for damages. If any grantor is left with a grievance, or supposed grievance, it will be necessary to approach him again in the near future.

Some undertakers do not make separate annual payments to tenants, who, quite correctly, fail to see the justice of another being paid for the inconvenience to which they are put. The fact must be faced that tenants can and will insist on a yearly compensation for interference.

Fixtures in Grass Land

Sometimes owner-farmers claim higher rentals for fixtures in grass land. This cannot always be substantiated; but it is a fact that many good farmers these days lay out as much as £5 per acre to secure profuse pasturage, in which case they are entitled to "arable" terms. Representatives make a great show of maintaining that the best grass can always be seen under overhead wires, apparently proving that the droppings improve the crop, but what is an effective rejoinder when the occupier points out that the reason is because cattle refuse to graze it?

The form of agreement too, affects wayleave progress. An elaborate budget of imposing aspect intimidates a non-legal mind, so that the simpler and shorter the document the better. Some grantors like to refer the matter to their solicitors who in turn prefer to draft their own agreement if only to enlarge their fees. A "letter agreement" on one sheet can embody all that is required, and will have the advantage of entailing only 6d. stamp duty.

In assessing rentals and compensations on steel tower lines one will find it (as did the C.E.B.) to be advantageous *not* to assume it possible to take crops from under the towers but to calculate rentals on the assumption that no crops will be taken on the island under and around the towers. These waste areas can be assumed to be as hereunder, as accepted by the National Farmers' Union:—

Type of Fixture.	Area of Unproductive Island.
Single poles	A circle 7ft. 6in. in diameter.
H poles	A rectangle 12ft. × 7ft. 6in.
4ft. square Towers	A square 10ft. × 10ft.
5ft. square Towers	A square 11ft. × 11ft.
6ft. square Towers	A square 12ft. × 12ft.

Extra Costs and Crop Values

At secondary arbitrations the inspector will take into consideration, for annual compensations, whether one or two crops are taken off in one year, any inconvenience to ploughing or mowing and any special peculiarities of each individual case. He will assume that the farmer is entitled to cultivate in the very best manner, and take into consideration the cost of keeping clean the unproductive island around the towers; the loss of crop under and around the towers; the loss of time caused by the plough and other implements deviating out of the straight, and any other inconvenience in working the field; the reduction in crop produced in the vicinity of the tower owing to ground being trodden down where the cultivating instruments pass over the same ground in deviating round corners; and—it must be faced again—amenities. It will be noted that a farmer must dig by hand, three times during the growing season, a belt at least 2 ft. 6 in. wide round the unproductive island to keep down the perennial weed or twitch. He will estimate the time involved in these measures and the cost of labour. So that it is very evident that arbitration must be shunned like the plague by the supply authority.

For compensation values the figures prepared by the N.F.U. are also convenient and useful. By actually computing the extent of damages sustained and by agreeing this area with the occupier very favourable settlements can be made. The secret is to obtain his written confirmation of the *area* affected by the poles or lines before proceeding to calculate.

Cereals are reckoned at 45s. per qr., yield at 5 qr. per acre.
Peas, 4s. per bag, yield 100 bags per acre.
Potatoes at £5 per ton, yield at 6 tons per acre.
Beet at 45s. per ton, yield at 8 tons per acre.
Roots at 15s. per ton, yield at 20 tons per acre.
Clover at £3 per ton, yield at 2½ tons per acre.

Actual local prices vary, but the above figures are on the right side for the grantor.

Verge Rights

Before any fixture can be placed on public property it is necessary to secure the approval of the surveyor to the highway authority concerned. The positions as agreed on site should be precisely and definitely noted, in order to avoid confusion, stating: whether the poles are on the footpath or carriageway; whether tight up against the boundary fence or hedge; whether built into the cop, bank, or wall; or whether placed in a grass verge at a specified distance from the carriageway. A copy of this schedule, together with an explanatory plan of the route should be sent to the surveyor for confirmation.

It may be assumed that the surveyor has jurisdiction to the centre of the road hedges; but the case of verge rights is often contended by abutting owners, who also claim rentals for poles on the highway by reason of sub-soil ownership. These cause much trouble on low-voltage networks and in the keeping of wayleave records. With regard to verge rights, in the absence of any special mention in the title deeds, in the case of an ordinary highway, whether of uniform or varying width, running between fences, the right of passage, or way, extends to the whole space between the fences and the public are not confined to any part only which may have been prepared for carriage-way, &c.

Thus it will be seen that, apart from statutory authority, the placing of poles on the greensward at the side of the highway so as to occupy the right of passage may be construed as a nuisance, and a company empowered by statute to break up such streets for the purpose of its undertaking is entitled to erect such poles subject to the consent of the highway authority.

Poles on Public Highways

Regarding rental claims for poles on the highway the following is the legal position. The right of authorised undertakers to erect poles in the highway is a statutory right which has been granted to them under the Electricity (Supply) Acts, in which are incorporated Sections 6 and 7 of the Gas Works (Clauses) Act, 1847. Section 6 of that Act gives statutory right to the company to break up the street for the purpose of supplying electricity within its limits, but Section 7 prohibits undertakers breaking up streets not dedicated to public use without the consent of the owners/occupiers thereof. It has been held, therefore, that dedication brings the street in question under Section 6 for the purposes of public utility undertakings.

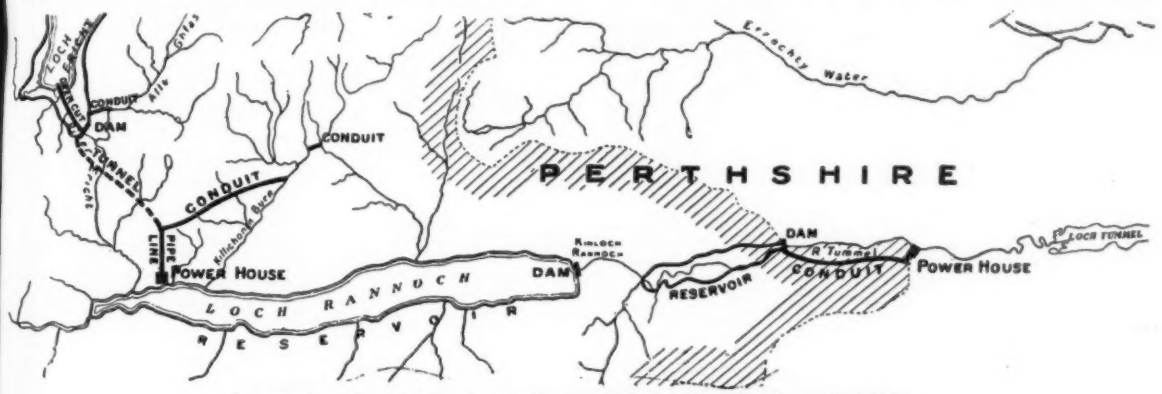
The claim that the sub-soil is not so dedicated may be arranged as between owner and local authority, but this contention does not apply where an undertaker is carrying out statutory works. Dedication as between the owner of the soil and the local authority involves something more than the mere occupation by the public of the surface. There can, then, be no claim for any specific depth, and so long as the street has been dedicated to public use no action for trespass could rightly be made for erecting poles therein, although the owner of the subsoil may be entitled to claim compensation if he can prove injury in any way. The position is, therefore, that an owner in such a case is not entitled to wayleave rental.

The Grampian Hydro-electric Scheme

Completion of the second stage

IN an article in the ELECTRICAL REVIEW of December 4th, 1931, we described how, under the first stage of the water-power scheme of the Grampian Electricity Supply Co., the waters of Loch Ericht had been harnessed for utilisation in the Rannoch power house at the western end of Loch Rannoch. The second stage provides for the utilisation of the flow of the River Tummel from Loch Rannoch and various tributaries to the River Tummel at Tummel Bridge, roughly 6½ miles east of Loch Rannoch and three miles west of Loch Tummel under a head of about 160 ft. That work has now been completed and the second power house at Tummel Bridge is in commercial operation.

At the River Tummel outlet of Loch Rannoch a controlling weir with electrically operated gates which are remotely controlled from the power station is situated to afford a maximum storage in the loch of 1,637 million cu. ft., equivalent to 4,540,000 kWh. The gates were manufactured by Messrs. Glenfield & Kennedy, Ltd. From this weir the water flows along the natural course of the river to a reservoir which has been created by an intake dam across the river at Dunalastair, about four miles down-stream. This reservoir has an available storage of more than 40.6 million cu. ft. (112,800 kWh), which is sufficient to balance the daily demands of the power station.



A map showing the layout of the Grampian hydro-electric undertaking

From Dunalastair the water is conveyed to the power house forebay, about three miles further down-stream, by an open concrete-lined aqueduct which follows the contour of the hillside with a gradient of one in 3,200. At this forebay two square sluice gates control the entrances to the two pipe lines which serve the turbines. The pipes are each 650 ft. long and 12 ft. 6 in. in diameter. They were supplied in semi-circular sections 8 ft. long, and the sections were welded together on site to form 8 ft. lengths for butt strapping together. The pipes are supported on roller bearings, and anchor blocks are provided at two points. The short concrete tail-race is in direct communication with the River Tummel, and the constructional work has involved the building of a reinforced-concrete bridge to carry the Tummel-Aberfeldy road over the tail-race. The power house is of steel and concrete block construction 175 ft. long, 90 ft. wide and 50 ft. high above floor level. In the absence of normal basement air ducts, cable trenches and flood-water channels are incorporated in the foundations with suitable access. The two horizontal Francis-type turbines, supplied by Messrs. Boving & Co., Ltd., are each of 22,000 h.p. They each have a double runner, a twin cast-iron spiral casing and a single discharge. Under a head of 160 ft. the normal speed is 300 r.p.m.

Production of the runners in chromium stainless-steel as a means of presenting greater resistance to cavitation has allowed the shaft centre line being placed about 4 ft. higher above tail-water level than would have been possible had cast-steel been employed. The turbines are direct coupled to 17,000-kW, 11,000-V 50-cycle, three-phase alternators made by the British Thomson-Houston Co., Ltd., and arrangements are made for uncoupling, so that the alternators can be run as synchronous condensers if desired. There is also an auxiliary 400-kW turbo-alternator which now serves as an emergency house set; it was originally employed in the temporary power station for a supply for the construction works.

Directly coupled to each alternator are main and auxiliary exciters, and to permit voltage regulation over a large excitation range a combination of an automatic motor-operated field rheostat and an improved arrangement of under- and over-excitation relays is employed. Ventilation air for the alternators is first drawn through filters, and it can be discharged either into the building or outside at will by manipulation of regulating louvres. A 120-ton travelling crane spans the turbine room.

The main switchgear and the control board are housed on a gallery on one side of the station. Of cellular construction the main switchgear has at present single bus-bars, but provision has been made for the duplication of these later on if necessary. Controlling the alternators and two 11 to 132-kV transformers, there are four main motor-operated oil circuit-breakers, each with a rupturing capacity of 750,000 kVA.

Connected to the main switchboard through reactors there is an auxiliary 11-kV switchboard which serves for a 33-kV supply. This auxiliary board is equipped with oil circuit-breakers of 150,000-kVA rupturing capacity. So that the supply pressure at this board may be varied independently of the main bus-bar voltage it is controlled by automatic tap-changing boosters with a 20 to 25 per cent. regulation. A 400-kW auxiliary alternator can also be connected to this switchboard independently of the main alternators. A 440/250-V local supply is provided by means of tertiary windings on the 11/33-kV transformers. A duplicate 440-V supply from a battery is available via automatic emergency switches. On a hydraulic control panel indications are given of the Loch Rannoch water level; the openings of the control weir gates, aqueduct gates and intake dam-gates; and the water levels of the intake dam reservoir, the aqueduct below the intake forebay and the tail-race. All these indications are given on a schematic diagram of the system.

The outdoor sub-station at Tummel Bridge

The 11/132-kV transformers in the sub-station are each of 21,000-kVA capacity and are delta-star connected. Power switching is done on the main 11-kV board. Two 5,000-kVA transformers in the same sub-station serve the 33-kV system. They are oil cooled and star-delta connected. The switching station is arranged in two parts, one for the 132-kV supply and one for the 33-kV system.

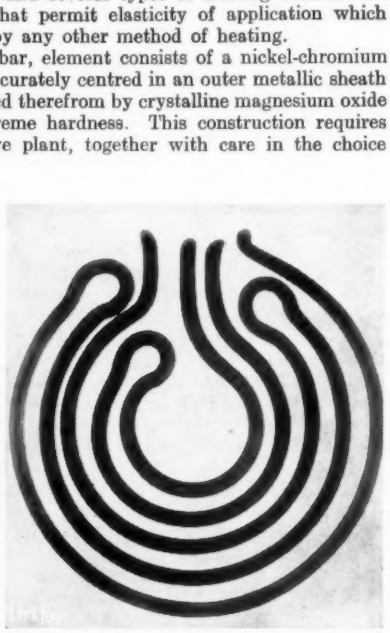
The 33-kV lines from Rannoch are looped in to the switching station and suitable switching arrangements are provided, so that, if desired, the 33-kV lines from Rannoch can be cut out and the whole supply given from Tummel. The whole of the Grampian scheme has been designed and constructed by Messrs. Balfour, Beatty & Co., Ltd.

Concentrated Heating. By F. Baxendale

The choice of element

IN most industries there are processes that demand the provision of "spots" or "zones" of localised heat. The most satisfactory and convenient methods to employ are electrical, and several types of heating element are already available that permit elasticity of application which cannot be offered by any other method of heating.

The rod, or torribar, element consists of a nickel-chromium resistance spiral, accurately centred in an outer metallic sheath or tube and insulated therefrom by crystalline magnesium oxide compressed to extreme hardness. This construction requires somewhat expensive plant, together with care in the choice of materials and manufacturing conditions, but results in an element which is extremely robust, can be bent and adapted to any required shape, and is practically indestructible under normal working conditions, while possessing a large safety margin.



An X-ray photograph of torribar element, showing the heating spiral

The sheath material can be varied to suit the particular application, such as tinned copper for water heating; mild steel and monel metal for immersion in oil (tinned copper is not suitable for immersion in many grades of oil); Alumbro for air heating; mild steel when the element is cast into iron to form heaters for soft metal melting, or cast into lead for acid bath heating, or fitted to suitable grooves in platens; and stainless steel when operating as a radiant heater at high temperatures. The outer sheath is not "live" electrically, and is therefore safer in operation than a heater of which the exposed material is carrying the current.

For Immersion or as Heating Plates

As an immersion heater, this type of element can be used for heating water, oils, waxes, dilute acid, soda baths and for the melting of soft metals. When cast into blocks or plates it may be used for boiling plates, platens, brick presses, moulding machines, and in the printing trade for stereotype metal pots, fudge pots, linotype pots, embossing machines, &c.

For operating in air these elements can be applied to ovens for japanning or air drawing, confectionery work, internal heating of hollow rolls, drying of printed papers and fabrics by radiant heat, and air heating when using an outer casing in the form of gilled tubing. The elements can be designed to operate with surface temperatures up to 1,650 deg. F.

The cartridge insert heater is very useful where localised heating is required. It is cylindrical in shape, and standard sizes vary from $\frac{1}{4}$ in. to $\frac{5}{8}$ in. diameter with individual loadings from 65 to 300 W. In common with every conductive heater it is essential that there be good contact between the heater and the material to be heated. The cylindrical form is readily fitted to a drilled and reamered hole of appropriate size, and for effective operation the radial clearance should be of the order of 0.002 in. The heater itself may consist of suitable resistance wire wound on an insulating core, surrounded by powdered magnesium oxide and the whole contained in a brass tube, or cartridge, which is swaged into a compact and solid mass of high density that is unaffected by vibration.

These elements may be employed to heat gluepots, compound pots, soldering irons, and in processes where a "spot" of heat is required, such as in boot making and cigarette manufacture. The sheath temperatures may be as high as 750 deg. F.

Low-temperature Work

Wire on mica elements may be used for comparatively low-temperature work, as the best grades of mica will dehydrate at about 1,100 deg. F. and will lose some of their insulating properties at 800 deg. F. They are employed in domestic irons and where high ohmic resistance is required in a confined space. They are necessarily contact heaters, usually encased in sheet metal covers. Wire-wound steatite elements are enclosed in plastic refractory material which is compressed and fired, or may be mounted upon a solid refractory core surrounded by a ceramic material in the form of paste, which is subsequently dried out. When used as immersion heaters, they require to be surrounded by a metal casing, from which they must be insulated.

Loop resistors consist of nickel-chromium, or other suitable alloy, wound upon insulating supports, and they may be used as space heaters or suspended from the walls, floors and roofs of furnaces. In general, they are limited to intermittent temperatures of 2,100 deg F., or constant temperatures of 1,900 deg. F. For furnace use it is desirable to employ low-voltage elements in order that the resistance ribbon or rod may be of substantial cross section and consequently have a long life.

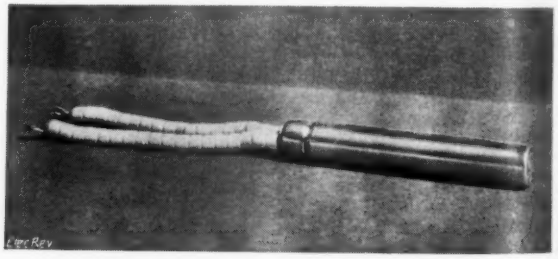
Strip and slab heaters are frequently constructed of resistance wire embedded in an insulating powder or paste and encased in sheet metal covers. If carefully constructed they may be used at surface temperatures up to 750 deg. F. in the same manner as cartridge heaters. They may be clamped to flat metal surfaces, but they do not possess great mechanical strength and cannot be bent. It is absolutely essential that uniformly good contact should exist between these heaters and the material to be heated, otherwise hot spots may develop and the heater may fail at these points.

Glass and Ceramic Processes

Non-metallic resistors may consist of graphite, carbon, silicon carbide and special compositions of silicon carbide and other ingredients ground and moulded into bars and rods. They may be used at intermittent surface temperatures up to 3,000 deg. F., or constant temperatures of 2,400 deg. F. and are applied in the glass and ceramic industries.

Electric heating for industrial purposes can usually be justified in one or more of the following conditions: Reduction of manufacturing costs by improving the product, lessening the quantity of rejects, increasing the rate of production, or reducing space occupied by the equipment; when other forms of heat cannot be applied; when good working conditions are essential, *e.g.*, cleanliness in the case of manufactured foodstuffs; when accuracy of temperature control is essential; where safety from fire risk or explosion is desired; and in cases where, owing to the efficiency with which it may be applied, it is found to be actually cheaper than other forms of heat.

During the past two years 118 individual "central" stations in America have each connected loads of the smaller industrial heating applications at the rate of from 600 to 1,000 kW per annum.



A typical cartridge heater

Acknowledgement is due to the British Thomson-Houston Co., Ltd., for facilities in connection with the preparation of this article.

The Paris High Tension Conference

The British National Committee of the Paris High Tension Conference is seeking to secure that British developments and practice are adequately represented by papers submitted to the 1937 sessions. The Conference is taking steps to reduce its labours and to improve the quality of its work and, to this end, is limiting the number of papers to be submitted by each country and increasing the responsibility of the National Committees by requiring them to exercise closer supervision over all papers submitted. The British Committee therefore asks that intending authors should notify its secretary without delay of the subjects of papers that they propose to submit, followed by a summary not exceeding, say, 300 words, which should be received not later than September 15th. The Committee has to submit all approved papers to Paris by December 31st and authors should therefore submit them to the secretary not later than the middle of November.

Electricity from Exhaust Steam. By G. T. Champion, Assoc.I.E.E.

How it may benefit the small power consumer

IS there any inducement for the comparatively small power consumer to consider some radical alteration in his source of energy supply where any reasonable quantity of low-pressure steam is required for process work and due advantage has not been taken of exhaust steam? The answer is definitely in the affirmative.

A general survey of the situation makes it clear that up to the present it has received insufficient consideration, despite the fact that very beneficial results may follow exhaust-steam utilisation. The opinion held by many power consumers that inefficient existing arrangements cannot be improved without recourse to excessive capital expenditure, stoppage of production and so forth, acts as a deterrent which cannot in the great majority of cases be justified.

A Good Investment

The average yield on capital expenditure resulting from the installation of exhaust-steam utilisation plant is of the order of 18 to 20 per cent. Moreover, due to the subsequent reduction in the cost of electrical energy which may be effected by the installation of such a plant, advantage can be taken of the benefits of electrification to a greater extent than may previously have been found advantageous. Assuming then, that the yield on capital expenditure has given sufficient incentive to electrify either partly, or completely, due advantage may be taken, with no small benefit, of any public electricity supply available. It is important, however, to note that the nucleus of the procedure has been the economical utilisation of exhaust steam.

Machinery in the engine room of a textile mill in the West of England arranged for effecting heat-load balance and (right) the exhaust tanks

The possibilities of arranging for a composite source of electrical energy by means of a back-pressure or pass-out engine working in conjunction with the public service undoubtedly present a wide field for development.

Experience also teaches that the crude-oil generating set calls for serious consideration as an adjunct to the back-pressure or pass-out steam unit for peak loads, the standby losses and costs of production being extremely small.

Certain circumstances definitely contribute towards ideal conditions, such as the need to dry materials by hot-air circulation, which represents a very common requirement in a number of important industries. In such cases the exhaust steam can be effectively utilised for service to the heating system, the energy generated by the set being absorbed by the motors operating the circulating fans or blowers. A complete heat-load balance may thereby be effected, the generating unit forming a composite part of the drying installation as a whole. Should the blower motors absorb less energy than that produced by the set when exhausting the requisite quantity of steam for heating, then the surplus energy can generally be absorbed in a convenient manner by some other constant source of demand.

The salient requirement of a satisfactory exhaust-steam utilisation plant is the production of a heat-load balance; that is, the amount of steam passing through the engine over any given period of time should be such as will produce just sufficient energy to meet demands. A preliminary investigation must be undertaken in respect of the nature and extent of both steam and power demand before any decision is made as to the size of unit to be installed. The importance of these preliminary investigations cannot be over-rated.

In the ordinary course of events no particular difficulties present themselves in procuring such information as may be found necessary. Both steam and water meters may be hired at low rentals; also, in many cases a d.c. lighting service is available which may be conveniently utilised for the operation of a temporary test motor, also procured on hire, in order to determine the horse-power input required in connection with individual or group drives that may be under consideration. In cases where an a.c. plant is to be installed it is especially desirable to ascertain by actual test the horse-power output required of the various motors; the importance of undertaking a torque test also on the various drives must not be overlooked. Due regard to these matters will eliminate the possibility of running the motors inefficiently and at a low power factor.

A Textile Mill Installation

In a small plant recently installed in a West of England textile mill to my specification, the method adopted for obtaining a heat-load balance has definitely proved satisfactory, although perhaps somewhat removed from orthodox practice. When I recommended the installation of this plant, electrical energy was being produced for lighting only, by means of a 220-V d.c. generator rope-driven from the main 150-i.h.p. compound condensing engines, which formed the only source of power for driving the complete mill, apart from a small water wheel. This plant, together with two Lancashire boilers with economiser has been retained. The boilers steam at 80 lb. per sq. in. gauge, one serving the main engines and the other meeting process steam requirements; there is no superheater and the wetness fraction of the steam is somewhat high.

It was evident that considerable economies could be effected in the production of the hot water continuously required by the dye house, which was previously brought to the boil from cold by live steam, obviously a most uneconomical procedure.

At the outset, for well-defined reasons, it was decided to electrify one portion of the mill only and a 45-kVA three-phase, 50-cycle, 400-V alternator with outboard exciter driven by a 55-b.h.p. Bellis & Morcom single-cyinder, 500-r.p.m., back-pressure engine was installed. Under continuous full-load running conditions this engine would exhaust 2,350 lb. of steam per hr., which was in excess of that normally required for the time being, so it was decided to run this engine in conjunction with the main condensing engines. The alternative would have been the installation of a pass-out or bleeder-type engine with condenser, the capital cost of which would not have been justified, apart from other and technical considerations.

A countershaft was erected at the far end of the engine room

from which the alternator, which is mounted on channel-iron framework at the rear of the main switchboard, is driven by means of "Texropes." This countershaft is fitted with two sets of fast and loose pulleys; one of these is driven by the back-pressure engine, the other by the main condensing engines *via* an existing countershaft overhead from which is also driven the d.c. lighting dynamo on the ground floor under the alternator. The two belts are simultaneously controlled by a common striking gear.

The back-pressure engine is arranged to operate without cylinder lubrication and to exhaust against a back pressure of 2½ lb. per sq. in. through Holden & Brooke silent heating nozzles into two 500-gal. exhaust tanks mounted over the boiler tops. These tanks are interconnected and take their cold-water supply by gravitation *via* a ball-valve tank from a main cold-water service tank in the dye house. The latter is fed by an a.c. motor-driven centrifugal pump automatically operated by a float-controlled limit switch and direct-on starter.

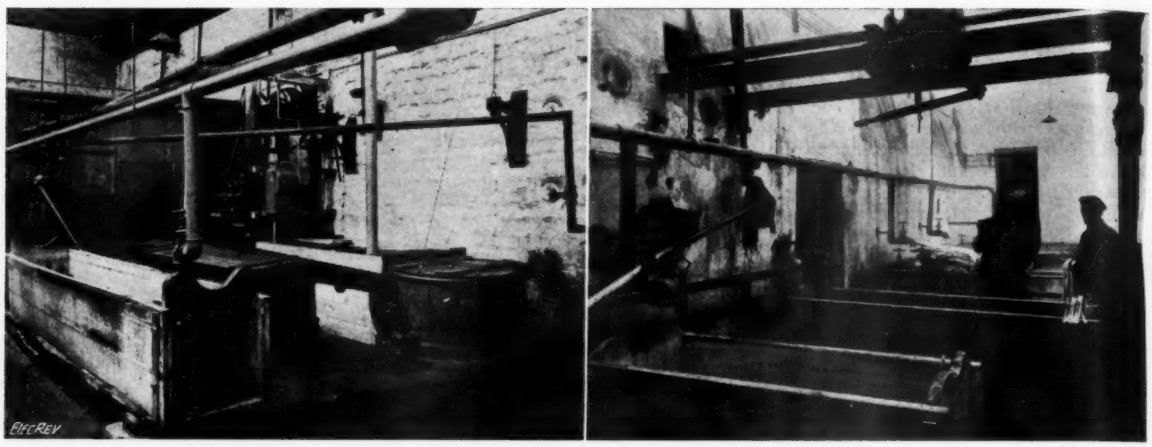
The exhaust tanks are heavily lagged, so that a short boosting charge in the early morning gives an immediate supply of water at a temperature close on boiling point to the dye house. One exhaust tank is fitted with an electrically operated thermostat, in circuit with which are red and white signal lamps and bells to give both visual and aural warning as to the temperature of the water in the tanks. According to requirements, as indicated by the thermostatically controlled signal system, the back-pressure engine takes over the alternator load from the main condensing engines and vice-versa; in the latter case it is shut down for the time being. The change over from condensing to back-pressure conditions causes no interference with the supply of electricity.

Thirteen a.c. motors have been installed of an aggregate output of 57 b.h.p. Verity D.S. high-torque squirrel-cage machines are employed, with the result that only one slip-ring motor (for driving a hydro-extractor) is required. A three-panel, open-type distribution switchboard has been installed; upon this is mounted a number of change-over switches. This board controls both the alternator of the back-pressure set and the 400-V, 50-cycle, three-phase service of the West Gloucestershire Power Co. which has now been brought into commission, serving a very useful purpose as and when required.

Apart from the general benefits that have resulted from this electrification, a continuous supply of hot water is now available during normal working hours for process work. The electrical service has made possible the automatic control of certain live-steam services by means of solenoid-operated valves working in conjunction with master time-switch equipment. Improvements have also been made in the removal of humid air from drying chambers, ventilation by means of exhaust fans, &c.

The economies effected are such that No. 2 boiler has been put out of commission so far as process steam requirements are concerned. Tests of suitable duration have shown that electricity is being generated at about 0.5d. per kWh, all fixed and running charges included—a creditable performance taking into consideration the steam conditions and size of plant. The electrical plant was supplied by Veritys, Ltd., and the equipment was installed by W. S. Barron & Sons, Ltd.

I would refer those interested in this subject to a paper by Mr. J. A. Sumner and comments on this published in the I.E.E. *Journal* Vols. 77 and 79 (pages 310 and 57, respectively.)



Lay-out of the hot-water service pipe lines to the various dye vats at the textile mills

Delegates to the World Power Conference

THE third World Power Conference and the second congress of the International Commission on Large Dams are to be held at Washington from September 7th to 12th at the invitation of the United States Government, and the British Government has nominated ten official delegates to represent this country. The head of the delegation is Viscount Falmouth, a past-president of E.D.A., and vice-president of the Conjoint Conference of Public Utility Associations, and the members are:—Mr. N. G. Gedye, O.B.E., Mr. T. Hardie, M.Inst.C.E. (Gas Light and Coke Co.), Mr. J. M. Kennedy, O.B.E., Pres. I.E.E., Dr. F. M. Lea (Building Research Station), Dr. C. H Merz, Sir Archibald Page (chairman, C.E.B.), Mr. C. Rodgers, O.B.E. (deputy-director of B.E.A.M.A.), Dr. F. S. Sinnatt (Director of Fuel Research), and Mr. E. T. Williams (Assistant Director of Electrical Engineering, Admiralty). The chairman of the International Executive Council and of the British National Committee is Sir Harold Hartley, C.B.E.

The joint opening session will be held in Constitution Hall, Washington, on Monday, September 7th, at 8.30 p.m. Business sessions will be held earlier on the same day and throughout the week. There will be an address by the President of the United States on September 11th at 2 p.m., followed by a garden party and reception at the White House. Among other functions there will be a garden party and reception at Mount Vernon on September 8th and the official dinner on September 10th.

Most of the British delegates are taking part in the interesting study tours which are being organised by the American National Committee, with which will be associated "round table" discussions between experts. One of these tours will take participants through Canada, where they will be the guests of the Government of the Province of Quebec and of the Dominion Government, by way of Niagara and Chicago, to view the great power projects of the West.

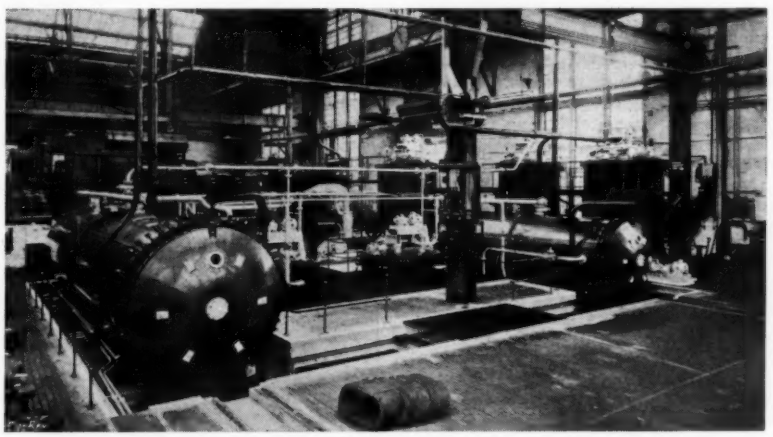
In addition to those who are mentioned above the following are members of the Conference and Congress:—

Mr. H. J. Allcock (Callender's); Mr. E. H. Ball (B.T.H. Co.); Mr. E. S. Barralet (Pinchin Johnson & Co.); Mr. F. E. Baumann; Mr. K. Baumann (Metropolitan-Vickers); Mr. S. E. Britton (city electrical engineer, Chester); Major J. W. Buckley (Metropolitan-Vickers); Mr. H. L. Buckman (London Passenger Transport Board); Mr. J. Caldwell; Mr. E. S. Calvert (Royal Aircraft Establishment, S. Farnborough); Dr. C. Douglas Campbell; Captain J. C. Chayter (Tamworth District Electric Supply Co.); Mr. H. W. Clothier (A. Reyrolle and Co.); Mr. J. C. Dalton (County of London E.S. Co.); Colonel J. R. Davidson, C.M.G. (Metropolitan Water Board); Mr. L. Drucquer (B.T.H. Co.); Mr. W. J. Drummond (Ashington Coal Co., Ltd.); Dr. A. E. Dunstan (Anglo-Iranian Oil Co.); Mr. C. E. Fairburn (L.M.S. Railway); Mrs. G. Z. de Ferranti; Mr. V. Z. de Ferranti (Ferranti, Ltd.); Mr. Morland Fox (W. J. Jenkins & Co.); Colonel W. B. Glover (R. & A. Main, Ltd.); Mr. C. H. Gray (secretary, International Executive Council, World Power Conference); Mr. R. H. Gummer (International Combustion, Ltd.); Professor B. P. Haigh (Royal Naval College, Greenwich); Miss Caroline Haslett, C.B.E. (E.A.W.); Mr. B. Hellström (Rendel, Palmer and Tritton); Mr. G. Helps (Nuneaton Gas Co.); Mr. H. Hobson (general manager, C.E.B.); Mr. R. W. Hunter (Gas Light and Coke Co.); Mr. J. Kerfoot; Mr. J. J. Kewley (Anglo-Saxon and Asiatic Petroleum Cos.); Mr. G. H. Lake (city electrical engineer, Nottingham); Mr. H. C. Lamb (city electrical engineer, Manchester); Mr. W. A. Lee, C.B.E. (Mining Association of Great Britain); Mr. A. l'Herminier (International Combustion, Ltd.); Mr. C. le Maistre, C.B.E. (Director, British Standards Institution); Mr. C. H. Lydall (Merz & McLellan); Mr. R. B. Matthews; Mr. R. de S. Merz; Mr. R. C. Mildner (Standard Telephones and Cables); Colonel T. H. Minshall, D.S.O.; Mr. G. H. Nelson (English Electric Co., Ltd.); Mr. H. G. Nelson; Mr. J. H. Parker (London Transport); Mr. J. Rogers; Mr. D. V. Seddon; Mr. E. Seddon (city electrical engineer, Edinburgh); Mr. W. M. Selvey; Mr. E. E. Sharp (Venner Time Switches); Mr. T. Y. Sherwell (Mather & Platt, Ltd.); and Mr. B. Sykes (Royal Aircraft Establishment, S. Farnborough).

Improved Impregnation Plant

Capable of treating the windings of turbo-generators of up to 200,000 kw

FEATURES of the insulation impregnation plant recently installed at the works of the Metropolitan-Vickers Electrical Co., Ltd., to supplement existing equipment are that the insulating compounds are introduced without breaking the exceptionally high vacuum; the air which forces the insulating compounds into the pores is not only employed under pressures up to 100 lb. per sq. in., but is very thoroughly dried before admission; the temperature, vacuum and air pressure are accurately regulated. The two horizontal impregnators, two hot and four cold mixing vessels, five transfer and two vacuum pumps, an air compressor and a fume extractor were supplied by the General Engineering Co., (Radcliffe), Ltd. The horizontal impregnators are respectively of 30 ft. and 20 ft. net internal length, the former being long enough to take the windings of turbo-generators of up to 200,000 kW. For heating the impregnators, steam is passed through coils of solid-drawn steel tube within the shells. Tanks are provided to hold the racks which carry the coils (electric windings to be treated) and the impregnating mixtures; they are fitted with flanged wheels and can be drawn in and out of the impregnators on rails by motor-driven winches. These tanks can be filled or emptied while inside the impregnators and without opening the front cover.



Insulation impregnation plant at the Met.-Vick. works

The two hot mixing vessels, mounted vertically in a pit between the impregnators, are designed for melting a bitumen gum compound and for both vacuum and pressure service. They are made of welded steel plate, and heating is effected by steam through patent panel coils of solid-drawn steel tube clamped outside the vessel and also through a concentric grid coil fitted outside the bottom of the vessel. The mixing gear for each vessel, which consists of an agitator having a vertical shaft passing through an oil-sealed gland, is driven through worm reduction gear by a squirrel-cage motor mounted upon the vessel.

On the floor of the pit is a steam-jacketed pump, driven through spur gearing by a squirrel-cage motor, used to transfer bitumen gum compound through steam-jacketed pipes and valves from either of the hot mixing vessels to either of the impregnators, or *vice versa*, while both are under high vacuum. The three cold mixing vessels are mounted vertically, and are used for different cold insulating varnishes and are designed for both vacuum and pressure service.

For extracting fumes during the final stages of cooling a 6 in. outlet pipe from the top of each impregnator is led to a fan, driven by a squirrel-cage motor; both the outlet valve for fume extraction and the inlet valve for fresh air are oil-sealed. The two high-vacuum pumps are each fitted with an oil separator and a gilled water tube condenser, and each is driven by a squirrel-cage motor. The air compressor is driven by a slip-ring motor and has a silica-gel air dryer with an electric reactivation heater. The vacuum and compressed air pipe lines are also connected to all the hot and cold mixing vessels, so that transfer of compound, &c., between any of the vessels and either impregnator can be effected, if desired, by raising and lowering the air pressure and vacuum as required. All the insulating compounds and varnishes used in the plant are manufactured in the company's research laboratories from the raw ingredients.

Graphic records are made automatically of the temperatures in the two impregnators and the two hot mixing vessels throughout each complete drying-out and impregnation process by a four-pen chart recorder made by the Electroflo Meter Co., Ltd., and actuated by thermo-couples placed in each of the vessels concerned.

Meter Testing Constants. By G. W. Stubbings, B.Sc., A.M.I.E.E.

IN an electricity meter the number of revolutions of the rotating element executed during any period is nominally proportional to the energy which passes the meter during this period. The exact numerical relation between revolutions and kWh is a matter of secondary importance, since the register of the meter can easily be made direct reading by suitable adjustment of the gear train between the meter rotor and the kWh dials.

When a meter is tested by comparing the dial registrations during a period with a known amount of energy which had passed the meter during this period the characteristics of the dial train need not be known. If another method of testing is employed, in which the number of revolutions of the meter disc is used as a basis, then the velocity ratio of the dial train must be known and used, either directly or indirectly, in order that the observed test data may be interpreted.

The most direct way of specifying the characteristic of the dial train is in terms of the velocity ratio of the rotor and the spindle of the pointer which makes one revolution per kWh. This ratio is usually expressed as the revolutions of the meter disc per kWh, and the characteristic of the gear train is generally expressed in this manner. The revolutions-per-kWh gearing constant is very convenient when it is desired to check the velocity ratio by actual observation of the components of the train, but when a meter is tested by an indirect method it is usually convenient to convert the revolutions-per-kWh constant into another form.

There are two indirect methods of testing meters. In one the sub-standard instrument is an integrating meter which is so designed that small amounts of energy are accurately registered by direct indications of fractional parts of complete revolutions of the meter disc. The usual method of testing with a sub-standard integrating meter is to energise it during a period in which the rotor of the test meter executes an exact number of revolutions. The registration of the sub-standard meter gives, after correction, the precise amount of energy corresponding to the rotation of the test meter. To interpret the test observations the nominal amount of energy corresponding to this rotation must be determined. For this purpose the usual " revolutions per kWh " is not immediately applicable, and a better method of expressing the gear-train ratio would evidently be the inverse of the usual method, viz., kWh per revolution. Having the constant so expressed, by a proper choice of the number of revolutions for the test period the nominal energy registered by the test meter can be obtained at once without calculation.

The second indirect method of meter testing consists in the determination of the angular speed of the rotor of the test meter which corresponds to an observed value of the power as indicated by a sub-standard wattmeter. The data corresponding to the speed obtained in the test is invariably a time period required for the execution of an exact number of revolutions by the meter disc; the practical method of testing on this principle generally consists in a comparison of the observed time with the " true time," which corresponds to the known value of the watts. In this case, again, the usual revolutions-per-kWh constant is useless as it stands; what is required by the meter tester is the number of seconds per revolution corresponding to a stipulated value of the power. The most convenient form of constant for this method of testing is watt-seconds per revolution. Having this constant, and

choosing a number of revolutions which is a simple sub-multiple of the watts, the "true time" is at once obtained by a simple mental calculation. The practical constant required for time tests is connected with that required for sub-standard tests by a reciprocal relation, the one being expressed in time and the other in revolutions.

Although the conversion of the usual revolutions-per-kWh constant into other forms more useful for practical purposes involves only a fairly simple numerical calculation, it seems obvious that gear-train ratios should be expressed in the forms in which they are actually required for testing purposes, so that unnecessary calculations involving a risk of mistakes may be avoided. A practical suggestion is that all meter gear-train ratios should be expressed in two forms, and that the numerical values should be plainly marked on the clock register. These test constants should be (*a*) kWh per revolution, and (*b*) watt-seconds per revolution. The first of these constants is numerically equal to the velocity ratio of the 1/10 unit spindle and the meter rotor, so that checking of the gear-train by observation remains quite easy.

Locomotive Coaling

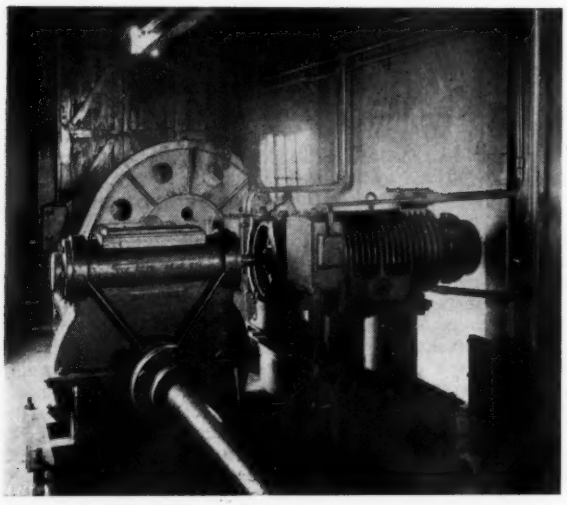
Electrical features of modern L.M.S. plant at Accrington

THE locomotive coaling plant which has been installed by the L.M.S. Railway Co. (chief mechanical engineer, Mr. W. A. Stanier) at Accrington embodies the usual features of a counterbalanced wagon hoist, permitting the coal to be side discharged into an elevated bunker having two compartments, each of 75 tons capacity. The wagons, of from 8 to 20 tons capacity, are capstan operated on to the hoist table and, when hoisted, discharge their contents into either side of the bunker according to the setting of a two-way flap valve. The coal from the bunker is discharged by means of jigging feeders, each working on to a three-way discharge flap valve which can be inclined to guide the flow of coal, as desired, on to the locomotive tender.

Incorporated in the plant are several electrical features designed to facilitate handling by unskilled men and to avoid risk of structural damage resulting from electrical failures.

A main control cabin is at ground level and accommodates the incoming electricity mains, isolating switches, distribution boards, meters, and the control panel for the capstan. With this arrangement it is possible quickly to isolate sections or the whole of the plant. The wagon hoist winch is above the bunker, grouped with the hoist motor, brake, resistances, motor automatic control panel, main-current ultimate limit switches and the gear-driven shunt limit switches.

In the shunt limit switch mechanism (of the Dalyte Electric Co.'s make) a departure has been made from the older type. The screw is stationary and the operating nut now takes the form of a disc fitted with a cam, which is revolved by gearing from winch motion to meet the switch lever mounted crosswise over the screw. The switch lever is thus operated in approximately 1/9th of a turn of the nut and resets with a similar amount of movement, which represents only a few inches movement on the hoist table, instead of the several feet formerly needed.



The hoisting gear, motor brake and control panel

In the event of failure of the wagon-hoist shunt limit switches, over-running in either direction is avoided by two main-current ultimate limit switches, which are mechanically operated, one by the upward movement of the table itself and in the reverse direction by the upward movement of the table balance weights.

These switches are of the circuit-breaker type and were designed for this particular duty; the operating rods work direct on to the switch arms, which trip the switch mechanism with approximately 2 in. excess travel of the hoist. Reliance is not placed entirely on the tripping mechanism in the switch, as further movement of the hoist will mechanically thrust open the switch contacts irrespective of the tripping device.

Accrington coaling plant with wagon ascending

The ultimate limit switches are arranged to be reset by hand so as to ensure that the operator is made aware that an overrun has occurred. Each switch is wired in the respective directional contactor main circuit so that it is possible to back out by power after an over-run; the switches, with their operating rods, cannot be reset until the hoist is back in its normal working position. The hoist motor panel enables control to be changed over from "remote" to "local" in order that adjustments may be made easily in the presence of the person operating the panel.

The coal-discharging portion of the plant is provided with two operator's cabins at engine footplate level near the bunker outlets, each containing a mechanical coal recorder (of Messrs. Harding-Rhodes' manufacture), jigger motor starting panel and actuating lever for the three-way discharge flap valve. The coal-recorder handle incorporates the master switch for starting the jigger motor, and the "stop" position automatically resets the overload releases when tripped. It is necessary to return the handle to the "stop" position after voltage failure; it is spring loaded and cannot be left in the "run" position, which ensures that the amount of coal taken is duly recorded, the figures being registered on a tape by the return motion of the handle.

The actuating lever for the discharge flap valve is interlocked with the motor starter in such a way as to prevent starting and stopping by merely operating the flap valve lever, which would damage the valves and give an incorrect record of the coal taken by any particular engine.

Near the control cabin is a 1-ton capstan for hauling wagons on to the hoist table, so that during the time taken for hoisting and discharge of a wagon it is possible for the operator to prepare his next wagon for hoisting. The totally enclosed slip-ring hoist motor is of 30 b.h.p. at 750 r.p.m., 1 hr. rating. The Lancashire Dynamo & Crypto jigger motors are of 5 b.h.p. at 1,000 r.p.m., totally enclosed squirrel cage.

The control gear was supplied by Messrs. Allen West & Co., being all totally enclosed and dustproof. The main contractors for the plant were Messrs. Henry Lees & Co., Ltd., Glasgow.

Railway Signalling Apparatus

A new British standard specification dealing with the quality of material for railway mechanical signalling apparatus and point connections and fittings has been issued, and detailed drawings incorporating the dimensional standardisation will be available by the end of the year. The requirements for the quality of component parts cover electrically welded and forge welded chain, appropriate tolerances to be applied, &c. Copies of this specification (No. 689-1936) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

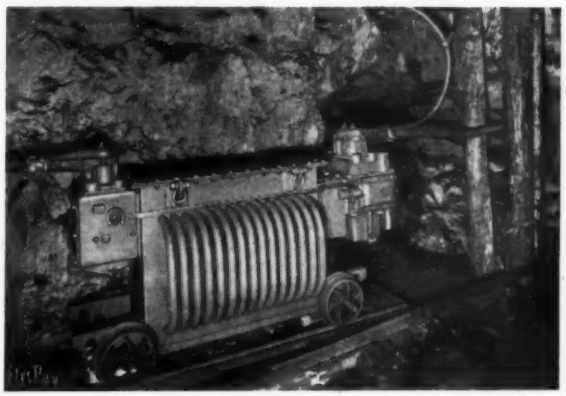
Colliery Distribution

A modernisation scheme in Leicestershire

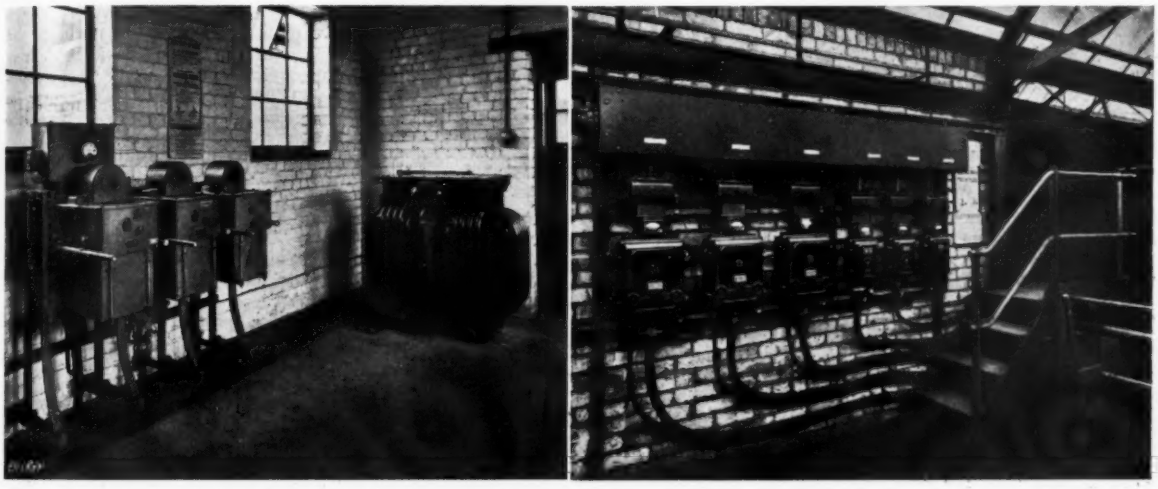
RECENT developments at the New Bagworth Colliery (near Leicester) of the Bagworth Coal Co., Ltd., include complete modernisation of the control and distribution system and extensions, with additional drives, to the screening plant, haulages and pumps.

Energy at 11,000 V is supplied by the Leicestershire and Warwickshire Electric Power Co., Ltd., *via* truck cubicle switchgear, from which a 250-kVA, 11,000/3,300-V transformer is fed. The lower-voltage side of the transformer is connected to the bus-bars of a 3-unit, pedestal-type, oil-immersed switchboard, the two outgoing switches controlling a feeder down No. 1 shaft and a 100-kVA, 3,300/440-V transformer which supplies the surface equipment *via* another pedestal switchboard. Both pedestal switchboards, the 100-kVA transformer and the truck cubicles are housed in the main sub-station.

The distribution board at the screening plant, comprising a closed metal bus-bar chamber, iron-clad switches and push-button direct-to-line contactor starters, is a good example of centralised control. The screening plant was supplied by Messrs. W. H. Baker & Son, and the electrical plant mentioned in this article by the General Electric Co., Ltd.



A portable mining transformer



3-kV switchgear serving shaft cable and surface-supply transformer and (right) centralised control distribution board for screening plant

The shaft feeder referred to terminates at one unit of a pedestal switchboard in an underground sub-station, the outgoing units supplying a portable mining sub-station, a 50-h.p. haulage motor and, *via* an outgoing feeder, a further pedestal switchboard at No. 2 shaft from which are fed a 50-kVA, 3,300/440-V transformer supplying pump and haulage motors, and a portable mining sub-station. A tee off the portable sub-station feeder serves a 25-kVA, 3,300/440/110-V transformer which supplies energy for auxiliary haulage and lighting.

A screening plant drive

The portable mining sub-station is specially designed for service near the coal face where there is low head room. It comprises a 75-kVA, three-phase, 33,000/440-V oil-immersed natural-cooled transformer, high- and low-voltage switchgear and plug-in cable boxes mounted at each end of the tank. The high-voltage flameproof switchgear takes the form of a three-phase, air-insulated, quick-break isolator, which is intended to break the magnetising current only of the transformer. Controlling the low-voltage side of the transformer is a flameproof three-phase non-draw-out oil circuit-breaker fitted with three overload trips and one no-volt and earth-leakage trip coil.

A handle for interlocking and operating both the high- and low-voltage switchgear is chained to the equipment and can only be removed from the low-voltage breaker when the latter is open, thus ensuring that the load is removed from the transformer before the high-voltage links are opened. The neutral point of the low-voltage winding is brought out to a flameproof housing mounted on the side of the transformer and earthed directly from this point. A link in the main neutral connection facilitates testing, and the complete "sub" is mounted on flanged wheels, so that it may be moved on the underground tub rails.

Suitable protective features are incorporated in the equipment. The 11,000-V oil circuit-breakers are fitted with two calibrated overloads, shunted by time-limit fuses, and an earth-leakage coil is also included which, together with the overload coils, is operated from current transformers.

All the pedestal oil circuit-breakers are of the draw-out type, and are supplied with direct-acting overload coils. Earth-leakage protection of each outgoing feeder is afforded by a direct-acting leakage trip operated at ten per cent. normal current from the secondary of a core balance type of current transformer, the three primary coils of which carry the main phase currents of the unit.

Public Lighting Engineers' Conference

The thirteenth annual conference of the Association of Public Lighting Engineers is to be held at Cheltenham from September 7th to 10th, under the presidency of Mr. E. C. Lennox, M.I.E.E.

Penalising the Industrial User. By S. A. Strode

Is the domestic consumer unduly favoured?

ELECTRICITY supply authorities and other electrical bodies are heard to express great satisfaction at the rapid growth of the use of domestic electric cookers and to express surprise because large caterers are not so ready to avail themselves of the "cheap and abundant supply." When one considers the manner in which large industrial consumers are sometimes made to pay exorbitant tariffs in order that attractive rates may be offered to small domestic users, it is not surprising that the former class hesitate somewhat to become all-electric.

In my home a cooker having a loading of 4 kW, a 2-kW fire, a 500-W iron and about 500 W of lighting may be used for a standing charge of £2 9s. 6d. per annum, plus ½d. per kWh for the whole consumption. A poorer house with the same demand would pay a smaller standing charge.

A manufacturing company with which I am associated takes an extra-high-voltage supply from the same authority and pays £5 per annum per kVA of maximum demand plus ½d. per kWh for the whole consumption. Below appears a comparison of costs of the private house and the manufacturing company using 200 kW of cooking load in its canteen.

	Private House.	Manufacturer.
Maximum demand ...	7 kW.	200 kW.
Standing annual charge	£2 9 6	£1,000
Unit charge per annum	2,000 at ½d., £4 3 4	100,000 at ½d., £208 6 8
Total annual charge ...	£6 12 10	£1,208 6 8
Total price per kWh ...	0.797d.	2.9d.
Load factor (one year)...	3.3%	5.7%

It might be suggested that the canteen cooking load would occur at an off-peak period and not increase the maximum demand. This, however, cannot be guaranteed as dark and foggy days occur during winter when all lights are on during the daytime. It would be necessary for the canteen load to coincide with the works full load for only one quarter of an hour during a whole year to increase that year's kVA charge by £1,000.

A further analysis of the manufacturer's charges is given below, ignoring canteen load, assuming a maximum demand of 600 kVA and an annual consumption of 1,300,000 kWh. This gives an average load factor of 88 per cent. for forty-seven hours per week for fifty-two weeks per year. Power factor is assumed to be unity, which entails capital expenditure for its achievement.

Maximum demand	600 kVA
Maximum demand charge	£3,000
Unit charge per annum	£2,708 6 8
Total annual charge	£5,708 6 8
Total price per kWh...	1.054d.
Load factor (one year)	24.7%.

From the above figures it is seen that for having a load factor more than seven times that of the domestic user and an annual consumption six hundred and fifty times that of the domestic user, the manufacturer's reward is to pay 32 per cent. extra per kWh. Further, in order to obtain a supply on these attractive terms, the manufacturer has to bear considerable capital outlay in providing the whole cost of a sub-station and the whole cost of laying the service mains. Also, metering being on the high-voltage side, the day and night transformer losses are paid for by the consumer.

A reasonable valuation of the sub-station equipment, its housing and service mains is £2,500. This figure is not high when it is considered that in the case cited the consumer was called upon to provide in addition to his own essential gear, two ring main oil switch units, 150,000-kVA rupturing capacity, each equipped with three current transformers and overload trips *for protection of the supply authority's ring main*, also a metering unit equipped with three current transformers and a three-phase 11,000-V potential transformer *for operating the authority's meters*. These factors increase the electricity cost to the extent shown below:—

Interest on £2,500 at 5%	£125
Annual depreciation (Rated over 20 years.)	£125
Full load transformer loss 10.8 kW at £5	£54
28,000 kWh per year transformer loss at ½d.	£60
	£364

This annual charge raises the total price per kWh to 1.121d., which is 40 per cent. higher than the domestic consumer's figure of 0.797d. Surely there is no other commodity for which the large consistent user pays at a rate very much higher than that paid by the small inconsistent user.

Testing Bushings and Insulators

APPARATUS for ascertaining the electrical state of high-voltage bushings and also equipment for testing insulators on live lines is being introduced into this country by Doble Engineering, Ltd., Westminster, S.W.1.

By the Doble method, the condition of bushings, tank liners, oil, short cable sections, &c., from an insulation standpoint, is determined from dielectric loss and power-factor at the operating frequency (50 cycles per sec.). The measurement of these quantities is facilitated by using a voltmeter-ammeter-wattmeter arrangement, with deflecting instruments calibrated for the low power-factors involved. The instruments are mounted in a small case for portability. The associated equipment consists chiefly of a transformer with voltage control to provide the test voltage, and a shielded high-voltage cable for connection to the specimen under test.

Doble apparatus for testing bushings

In testing an oil circuit-breaker the breaker is opened and isolated and the test apparatus is connected to the high-voltage terminal of one of the bushings. The test potential is gradually raised to 10 kV at which point the ammeter and wattmeter readings are recorded. The power-factor may be easily obtained by one setting of a slide rule.

After each bushing has been tested the breaker is closed and readings are obtained on each phase by connecting the cable to either of the bushings in each tank. This measurement not only acts as a check on the open breaker tests, but also gives information on the condition of the operating rod, and further information on the condition of the oil and other insulating parts inside the tank. If all readings are normal, the test is complete; ninety-five per cent. of bushings tested fall into this class. The experience of the company is that less than half of the bad conditions likely to cause breakdown are due to deterioration of the main insulation. Other bad conditions likely to be encountered are oil, sludge or carbon deposits on the lower end of the bushing. Therefore, when abnormal readings are obtained the bushing is not condemned until further tests are made with the bushing clear of oil and cleaned.

Normal power-factors on sound bushings are from 0.5 to 3.0 per cent. The power-factor at which a bushing should be removed as having only a year's expectancy of life is a matter of experience, but roughly appears to be twice the normal. Bushings which would fail sooner have much higher power-factors; recent tests have disclosed a bushing with a power-factor as high as 35 per cent.

The method of line insulator testing is based upon the measurement of the voltage across each unit of a suspension string, or the voltage under each shed of a pin-type insulator to a low potential field. Any changes in the normal voltage exceeding 25 to 35 per cent. generally indicate a defective unit. Voltage is measured by means of a calibrated spark gap, which may be pre-set according to the line construction and type of insulator used. The presence of sufficient potential to break down the gap, denoting whether the unit is good or defective, is translated into a clearly defined sound by means of a telephone receiver in circuit with the gap. Sounds are conducted to the operator's ear by a hollow impregnated wooden tube and rubber hose. The wooden tube, of a minimum length of 5 ft., forms a combination stethoscope and insulating handle.

One of the important features of the Doble live-line insulator testers is the means employed to secure safety. All parts of the electrical circuit, except the contact tips, are enclosed in heavy rubber insulation. The suspension insulator tester which bridges the unit under test does not appreciably reduce the insulating value of the unit or the string. The pin-type tester utilises the low-voltage field near the cross-arm, thereby obviating possible dangers arising from the use of a ground wire. The company claims that the equipment can be used with complete safety.

Reflection and Translucency.

By W. P. Digby, M.I.E.E.

A method of measurement

NOT the least of the services that photometry has rendered has been that of assisting research into the value of reflection and the development of indirect methods of lighting. Means have become available of measuring the relation between the translucency and reflective value of materials. It is thus possible to ensure that the advantages of highly efficient lamps and reflecting surfaces shall not be wasted by the use of shades made of materials selected for æsthetic reasons alone. The method was originally devised for the establishment of standards for the callendering of certain woven materials. The apparatus employed is a modification of the reflection meter made by Everett, Edgcumbe & Co., Ltd., for investigating the tarnishing of ferrous and non-ferrous metals, variations in the nature and quantity of certain atmospheric impurities, the fading of paint, &c. The instrument has been suitably adapted to my design for the purpose of testing aircraft linen.

A sample of the material to be examined is fitted in one half of the instrument slide carrier, the other half accommodating (for comparison) a piece of standard material, which may be either white blotting paper or a slab of optically flat white porcelain.

A pair of photo-electric cells in the upper compartment of the instrument measure the light reflected vertically either from the standard reference material or from that which is to be examined. The illumination of the standard material is adjusted so as to indicate a constant value on the micro-ammeter of 100 divisions. The slide is then moved so that the material to be examined is subjected to the same source of illumination, and the reading on the micro-ammeter is noted. This is designated r, being the reflected light. The switch on the micro-ammeter is then moved to the second position, connecting two photo-electric cells in the lower compartment to the micro-ammeter. The new reading is noted and is designated t, the downward transmitted light.

Result of Tests

The values r and t will vary with the colour, smoothness of surface and thickness of the material under test. For any given colour smoothness of surface is important. Smooth paper is capable of greater vertical reflection than rough, while a highly callendered surface has a still larger reflection value. Three thick sheets of white paper having a rough surface had reflection values of 86.25, 97.25 and 87. The transmission value in each case was 2.5. The ratio r/t varied between 34.5 and 34.9. A sheet of thin white paper had a reflection value of 71.75 and a transmission value of 28.5; the ratio r/t was 2.51. Another sheet of similar white paper had a reflection value of 74 and a transmission value of 24.5, the ratio r/t being 3.01.

Complete standard equipment consisting of a storage battery, reflection meter and box containing electric cells, and micro-ammeter

It is important to ascertain the ratio of the values of the reflected and transmitted light. In certain processes this ratio can be used to measure the amount of treatment, such as callendering, given to a fabric. A good example is aeroplane linen of which the r/t value measured vertically shows a very rapid change from that of the linen in its loom condition, reaching a maximum value and then falling off with progressive passes through the heated rolls of the callender.

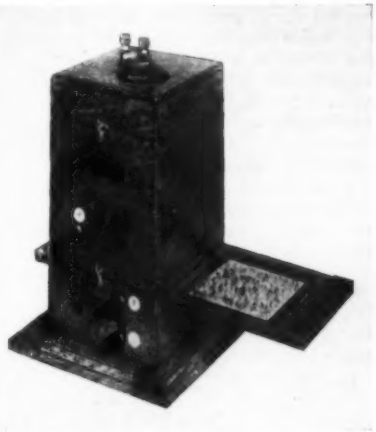
First the surface becomes smoother, the loss through specular reflection is reduced, the vertical reflection is increased, while, at the same time, the material becomes more compact and the transmitted light is reduced. With further callendering the thickness of the material is reduced and the transmitted light starts to increase.

Tests of four samples A, B, C and D, typical of the linen used on aeroplanes, are set out below :—

Sample.	Reflection r.	Transmission t.	Ratio r/t.	Remarks.
A	40	33	1.23	Material in loom condition.
B	44.5	25	1.675	Materials in various stages of callendering.
C	45.5	21	2.16	
D	45.0	23	1.95	

A very fine almost transparent silk fabric in its natural woven condition has a reflection value of 41 and a transmission value of 74, the r/t ratio being 0.554. If the silk is then treated so as to be in the condition termed "oiled silk," the reflection value falls to 13 and the transmission value rises to 125, the r/t ratio being 0.104.

A thicker silk would have different values and the r/t ratio rapidly reaches, and then exceeds, unity as the thickness increases. A woven cotton fabric, such as is used in making varnished cambric, having a reflection value of 52, will have a transmission value of 37 and an r/t ratio of 1.40. On coating the same cloth with varnish the reflection value will fall to the order of 27, and the transmission value will rise to 62, an r/t ratio of 0.435.



Reflection meter modified to measure translucency

That is to say, the instrument described would appear to have a wide range of utility and permit the description of the results of manufacturing processes, such as the callendering of various woven and compressed fibrous materials, or their coating with transparent material, in numerical terms.

An All-electric Town

WE have already referred to Mason City, Washington, "the town without chimneys." It is the settlement formed for the staff and employés engaged on the construction of a large hydro-electric undertaking. The "city" has a population of 3,000 and electricity is used exclusively for domestic service, there being a connected load of 12,250 kW.

The scheme has now been in operation for a year, and the *Electrical World* reports that during that period the consumption of electricity amounted to 12,301,630 kWh. The buildings comprise 288 residences, 114 bunkhouses and nineteen mess halls, business establishments and central lavatories.

A typical block in the residential area contained eight houses served from a bank of three 50-kVA transformers with the following electrical load: Four 4-room houses, 29.5 kW each, 118 kW (lights and appliances, 2 kW each; cooking, 8.5 kW each; water heating, 2.5 kW each; and heating, 16.5 kW each). Eight 3-room houses, 29.5 kW each, 212 kW; (lights, appliances, cooking and water heating same as five-room houses; heating, 13.5 kW each).

Each of the nineteen blocks of bunkhouses was served also from a bank of three 50-kVA transformers and each block consisted of the following: Five 12-room bunkhouses, 30 kW each, 150 kW (lights, 2 kW; heat, 28 kW). One 8-room bunkhouse, 32 kW (lights, 2 kW; heat, 30 kW). One lavatory, 43 kW (lights, 2 kW; water heaters, 28 kW; heat, 13 kW).

In the twelve-room, 24-man bunkhouses a 3-kW heater was installed in each of the four corner rooms and a 2-kW heater in the remaining eight. The foremen's bunkhouses contained a 6-kW heater in the recreation room, two 1-kW units in the hall, 3-kW heaters in two of the bedrooms and 2-kW units in the other six.

The average annual consumption of the 29.5-kW four-room houses was 21,770 kWh, or a monthly average of 1,814 kWh. For the three-room, 26.5-kW houses the average annual consumption was 17,480 kWh, or a monthly average of 1,456 kWh. The peak demand for the entire city load, including heating, was 4,800 kW; on the basis of the total consumption of 12,301,630 kWh the annual load factor was 29.3 per cent.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Suppressing Radio Interference

Why should the cost of radio interference suppression fall upon the manufacturer of "offending" plant? The plant did not offend before radio receivers attained the high degree of sensitivity they have now, and the plant is not always improved by the addition of condensers and filters in circuit.

I have in front of me the pamphlet published by the G.P.O. dealing with radio interference, and in it is a paragraph which states that the only satisfactory method of suppressing the interference caused by electric lifts in modern blocks of flats is to provide an outside aerial and an efficiently screened aerial network for connection to individual sets. This, from an authority which has spent quite a lot of time and money in experimenting with this problem, is an indication of the expense that a manufacturer of lifts, for instance, may have to bear if he is to be forced to remedy interference by a misdirected committee composed of members of the various supply and standards authorities who surely must see the great injustice of the steps they are taking in the matter. What would be the answer to a lift maker who put in his thoroughly reliable and efficient lift, using circuits which experience has taught him are the best for the peculiar duty, and countered the suggestion that he must fit suppressors by pointing out that the tenants are using indoor aerials or mains aerials and should install a central communal aerial?

When it was seen that fading took place on certain foreign stations and was spoiling reception, automatic volume control was evolved. Now that sets are being used with more and more valves, more sensitive tuning circuits, and by people who turn the set "full on" and use it as a background to their household duties, the manufacturer of "offending" plant has to take steps to suppress interference. This is a direct foisting of responsibility by the radio industry upon the plant and heavy industry. What is being done to counter it?

London, S.E.22, *August 1st.* HAROLD E. JOHNSON.

What is a Safe Voltage?

After reading Mr. Gilbert's interesting article on the effect of current passing from hand to hand, I recollected a curious effect observed with a sensitive galvanometer which appears to relate to Mr. Gilbert's subject.

The galvanometer was of the type employed with pyrometers and from recollection the pointer moved over a scale of approximately 8 in. It was found that if a person held in the palm of each hand an electrode consisting of silver and aluminium connected to the galvanometer, a deflection of from 1 to 3 in. would be obtained.

It was noticed that if the electrodes were held after the person had taken a quick walk, or other exercise which quickened the heart-beat and breathing, the pointer would move right across the scale. This was not entirely due to slight perspiration increasing the skin conductivity, since some of the persons making the test—out of curiosity—had normally dry or moist hands. In this case the body would act as an electrolyte having resistance, the resistance decreasing with an increase in the heart-beat rate. From this it would appear that risk from shock with a given voltage would increase whenever the nature of work involved considerable physical effort.

When the above curious effect was noticed it occurred to me that the varying resistance of the body might be a useful guide to the medical profession: if the body resistance can vary in health, it is probable that it will also vary during a severe illness, just as temperature will vary. It would therefore be possible to employ a sensitive mirror galvanometer and a light-sensitive cell actuated alarm system to call instant attention to a patient whenever any change in the body resistance occurred. This idea first occurred to me while I was at a farm and the farmer had lost two nights' sleep while watching a cow which was expected to calve at any time. The experiment with the galvanometer was recollected and appeared to suggest a means of permitting the farmer to get some sleep. However, it was never discovered how to apply the electrodes to the cow, so nothing more was done about the proposed alarm. A. G. BULLEN.

Liverpool, *August 1st.*

In one of the original papers by the late Dr. John Hopkinson, the fatal current was given as 0.3 A, but no particulars were given as to how this figure was arrived at. The voltage to produce this current would vary with different people owing to differences in skin resistance.

It is possible that people in feeble health would find a smaller current dangerous; and the psychological effect would be greater perhaps. In a warm climate a person standing on a wet floor, taking hold momentarily of a faulty switch at a potential of 100 V a.c. would receive a decidedly severe shock.

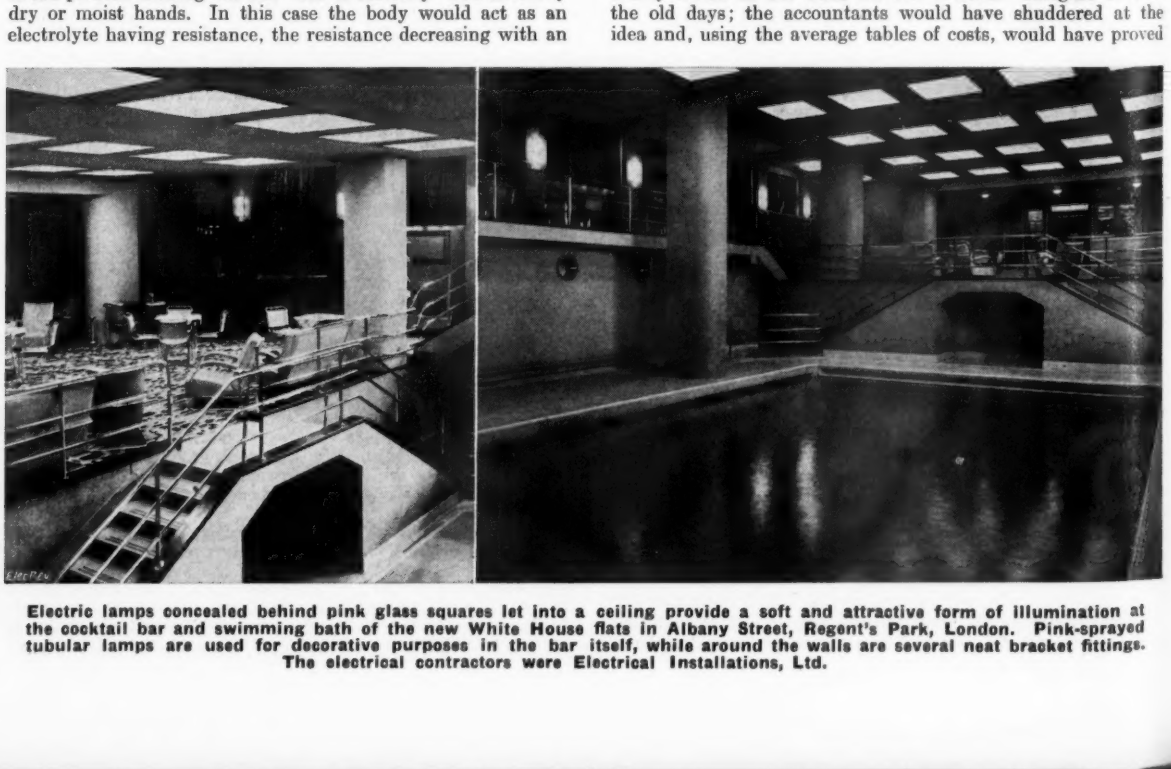
A man having had his thigh in contact with a wire at 6,000 V a.c. has recovered. The part burnt by the wire was deep and took several weeks to heal. In this case, however, the current did not pass through the vital organs.

Leeds, *August 4th.* W. E. PRITCHARD.

Why Standardised Tariffs?

To-day one can hardly open an electrical journal without reading rebukes from high authorities on the iniquity of our various tariffs, with warnings to set our house in order by instituting a small number of standard charges.

Curiously enough, other public utility departments are awakening to the benefits of variety in tariffs and they are applying electrical ideas with good results to their business. The Post Office is introducing new rates for telegrams and telephones and is encouraging off-peak load, and the gas companies are also following in our footsteps. The railway companies, hitherto models of rigid accountancy correctitude (which made them nearly go bankrupt), are introducing charges which rival ours in variety. On a recent occasion a railway company provided a long day's outing, including a railway journey out and home, a long charabanc ride and two hearty meals in the train for 13s. a head. Imagine that in the old days; the accountants would have shuddered at the idea and, using the average tables of costs, would have proved



Electric lamps concealed behind pink glass squares let into a ceiling provide a soft and attractive form of illumination at the cocktail bar and swimming bath of the new White House flats in Albany Street, Regent's Park, London. Pink-sprayed tubular lamps are used for decorative purposes in the bar itself, while around the walls are several neat bracket fittings. The electrical contractors were Electrical Installations, Ltd.

that it would have resulted in loss of money. Electrical men long ago showed that they could sell current at rates below the average all-in costs and yet make a profit out of it. This and other enterprising departures have been borrowed from the electrical industry and are based on the principle that it is better to be earning a little all the time than to try to exist by large profits and slow returns.

Why then should electrical men be so ashamed of the invention of various tariffs and of the discovery that money may be made by selling at prices which older business men thought would bring disaster and ruin? Is it not time that we recognised our own good work? Should we also not explain why it is that the price of current must be increased where the rates department of a municipality bleeds the undertaking to the uttermost? Generally speaking, it is impossible to get councillors to understand that this has any effect on the price charged, indeed, it is not unknown for the finance councillors to demand larger contributions from the electrical department in one meeting and then to ask in the electricity committee why the charges are not lower. Electrical managers do not make the public aware of the facts, and when people read strictures on tariffs from those in authority some of them begin to wonder if it would not be better to put the financial control of the undertaking into the hands of the treasurer who is, after all, the chief culprit.

Here is another tariff which may be new to some, and it is certainly successful in operation. The ordinary maximum-demand tariff was arranged to penalise the short-hour consumer, but this need has passed away. What we want to-day is a tariff which will automatically give shops a low rate for long-hour and after-hours use.

A simple method which meets requirements is to use the maximum-demand system along with the standard flat rate. If the hours of demand are kept reasonably short all shops which are not very short-hour get some energy at the low rate, and it is then easy to explain to them that if they run their shop windows after hours, they will automatically get them lighted at low rates. There is thus no need for clocks attached to meters to bring them into service only at certain times, while the tradesman is encouraged to keep lamps burning all day long in dark places. It is necessary to charge a small rent for the indicator to prevent people from asking for it when they do not need it, but when understood the method leads to increased consumption.

While the invention of new rates may well be restrained, this does not mean that it is to be stopped altogether, indeed, with the lower running charges obtainable under bulk supply terms, new tariffs must be evolved to spread the use of electricity to the uttermost. The discovery that it is possible to sell electricity at a profit on a tariff which apparently seemed to lead to a heavy loss was a great discovery resulting from experiment. It would never have been discovered by the old accountancy method which based charges on average costs plus a percentage for profits. Its possibilities have not been exhausted. VARIETY.

July 29th.

Turning to Electricity in the Irish Free State

Board connects 13,000 new consumers

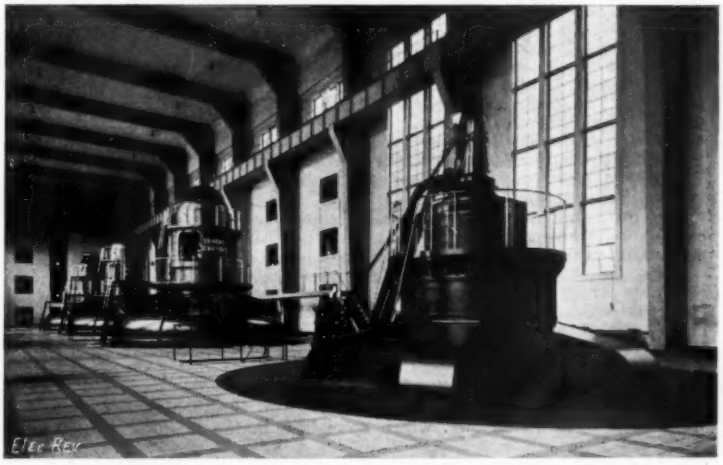
IN its scattered area, which comprises 206 towns and villages (out of a total of 232) having populations of less than 5,000 the Irish Free State Electricity Supply Board increased its sales by 19 per cent. to 187 million kWh and connected an additional 13,667 consumers (making the total 116,704) during the year to the end of March last.

To do this the Board, according to its latest report, continued its steady programme of development in both existing and new areas of supply, investing further capital to the extent of over half a million pounds. Extensive use was made of advertising, and the staff of canvassers and demonstrators was augmented so that consumers might have every opportunity of becoming acquainted with various household electrical apparatus. Special attention was given to the possibility of influencing builders to incorporate electrical features in the large number of new houses that are being built in the country by equipping demonstration all-electric houses in areas of substantial building activity, notably Dublin (where the house was visited by more than 110,000 people), Cork, Limerick and Waterford. In Dublin domestic development was particularly rapid, the increase in electricity so used in the environs of the city during the year reaching the high level of 63 per cent. With regard to the Board's area generally, the sale of appliances for which credit was taken amounted to £43,557 against £34,834 in the previous year. The number of cookers and water-heaters installed on hire increased by 55 and 68 per cent. respectively, while sales rose by 18 and 112 per cent.

As in England, the use of electricity for public lighting made great strides forward during the year, consumption being up by 15 per cent. Another important field of expansion was in hospitals. The success of the all-electric services at the National Maternity Hospital, Dublin, induced the responsible authorities to adopt similar services or to extend existing installations in thirteen other institutions. A number of religious establishments also took important loads, while forty-three local authorities are now obtaining power from the Board for the operation of water and sewage pumping schemes. A good many factories were connected during the year, the biggest new load being that of the Irish Dunlop Co. (1,480 h.p.). Industrial motive power is assuming a larger share of the total sales of the Board, the increase during the year being 22½ per cent., while the revenue from this source now amounts to 21 per cent. of the Board's total income.

Whereas the year's revenue rose by £171,483 to £1,436,939, expenditure was but a small amount higher than in the previous year. This was chiefly due to more favourable water conditions and the installation of generating plant of greater efficiency at the Pigeon House station. The result was a gross revenue of £309,938 against £167,135, and £78,789 was carried to reserve. The Board had not made any specific provision each year against the wastage of assets, except in the charge for vehicle and furniture depreciation and in respect of liabilities assumed by local authorities, but a sum of £230,000 has now been set aside.

Most of the energy (211 out of 244 million kWh) was generated at the Ardnacrusha station, where arrangements were made for the installation of a new runner wheel to increase the output of No. 1 turbine from 21,000 kW to 24,000 kW, while provision was made for a closed circuit air-cooling system for No. 1 alternator. Good progress was made with the work of securing additional water storage in Lough Allen, the contract providing for completion in 1937. To increase the capacity of the Pigeon House station contracts were placed for a 25,000-kVA turbo-generator and two steam boilers, and various works were carried out to improve the station. Considerable constructional work was effected in regard to the transmission and distribution system, 280 additional miles of overhead lines and underground cables being provided.



The power house of the Shannon Scheme at Ardnacrusha, County Limerick

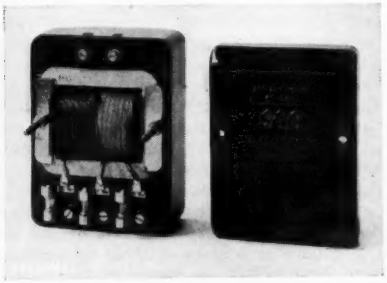
The River Liffey (or Poulaphouca) hydro-electric development scheme, involving the provision of a water storage reservoir to augment the water supply to the City of Dublin, was advanced during the year, the Board making arrangements with the Dublin Corporation which will allow the work on the reservoir to be undertaken as soon as the necessary legislative power is obtained. The average yearly production of the Liffey development is estimated at 30 million kWh.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Salford Accessories

Both the "Elf" and "Dwarf" domestic circuit-breakers made by SALFORD ELECTRICAL INSTRUMENTS, LTD., Peel Works, Silk Street, London, are now available as earth leakage breakers. The demand for these is mainly in rural areas where a sound and reliable earth connection is not always possible.



The new "Salford" fused bell transformer

They have all-insulated cases and will handle currents up to 30 A a.c.; for higher currents a relay may be used. The leakage trips operate at 30 A, ensuring that the fault voltage to earth cannot exceed 30 V. Each type has a test key so that the operation of the device may be checked at any time, and a periodical test is recommended.

Another new development is a bell transformer with fuses in the secondary circuit. Three fuses are fitted, one in each of the leads from the tapped secondary, supplying 4, 8 and 12 V. Two spares are carried in convenient recesses.

Another newcomer is a rectangular air thermostat available in brown or cream. The calibration range is 45 to 75 deg. F. and the adjusting knob is covered with an insulating cap. A variation of this model has a self-contained switch; the rating is 15 A at 250 V a.c.

Modern Lighting Fittings

Easy fixing is an outstanding feature of several new lighting fittings produced by MESSRS. TUCKER & EDGAR, Berkeley Works, Berkeley Road, London, N.W.1. Particular attention, too, has been paid in the totally enclosed models to providing adequate ventilation and at the same time a simple method of lamp replacement.

One of the most interesting designs is the "M.453," a brass ceiling fitting incorporating four closed-ended cylinders of satin finish glass which can be supplied in any colours. The normal finish of the metalwork is two-colour cellulose. As a departure from the somewhat severe design of the usual enclosed type of ceiling fitting for offices, &c., the "M.452" model has eight small radial fins linked by three metal bands.

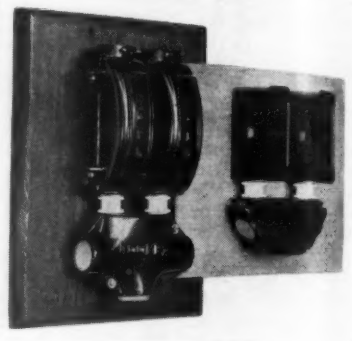
Among pendant fittings are the models "M.568" and "M.574," illustrated. The former is composed of four cellulose-sprayed spun metal circular tiers. The latter has a stipple-glazed body mounted above a circular glass plate supported on six metal arms. The glass plate is sand blasted with a pattern in clear glass, the edge being polished.

Three open-top glass bowls, which can be supplied with either 14 or 18 in. diameters, are mounted one above the other on a 5-ft.-long tube in the "M.570" model. A deep cream, with contrasting colours of red or green, is used for the general finish of the "570" fitting, which is a six-light pendant. The edge of the glass disc, which is supported by six arms, is "hit and miss" sand-blasted.

The above-mentioned fittings give some idea of the type of work done by the company, which specialises in the manufacture of fittings to harmonise with particular architectural or decoration schemes.

Bakelite Sealing Chambers and Fuse-boxes

Not the least important advantage of bakelite in its application to cable sealing chambers and fuse-boxes is the fact that the cost of installation is reduced, since no earthing is required, the non-conductivity of the moulded case rendering the installation shock-proof. In addition, there is a very considerable saving of weight, bakelite being only about one-third as heavy as cast-iron, and the installation occupies much less space.



A "Triumph" bakelite fuse-box

The UNITED ELECTICAL CO., (COOLEX), LTD., of Birmingham, has decided on the supersession of cast-iron by bakelite for part of its output of these components. The company does not undertake the moulding of its own cases, and the contract has been secured by the GREET MOULDING Co., Percy Road, Greet, Birmingham, 11.

"Goltone" Fittings

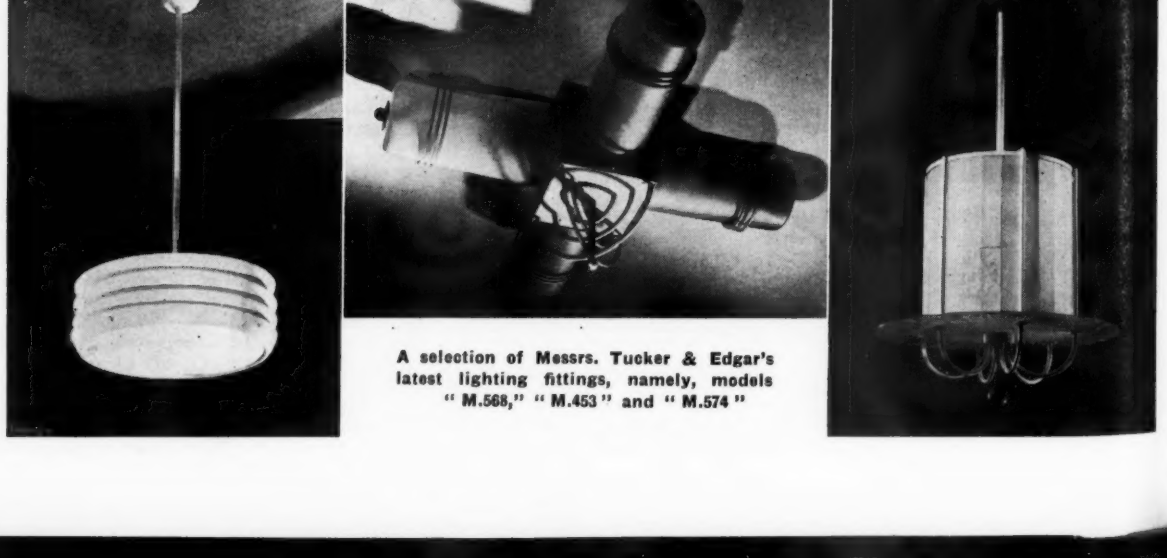
Recently introduced products of MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Salford, 6, include d.p., two-pin fused plugs, a radio suppressor unit and rubber cowls for bull-dog connectors.

A "Goltone" fused plug and bull-dog connector protected with a rubber cowl

The fused plugs are designed for the protection of radio sets and clocks, &c. They are interchangeable with B.S.S. standard 5-A two-pin plug bases and have a 2-A cartridge fuse in each pole. Both round and oblong shapes are made.

The radio interference suppressor is for fitting in the leads supplying the appliance which is creating the noise, and the condensers incorporated are claimed to be impervious to heat and moisture. The case is of high-grade bakelite with a cord grip.

For the protection of bull-dog connectors from 5 to 50 A there are rubber cowls which slide over the connector body.



A selection of Messrs. Tucker & Edgar's latest lighting fittings, namely, models "M.568," "M.453" and "M.574"

Spain's Electrical Imports

THE civil war in Spain lends interest to that country's electrical trade figures. Last year electrical imports suffered a setback as compared with 1934, but were slightly greater in value than they were in 1933. The total value in 1935 was 29,616,000 pesetas, as against 33,847,000 pesetas in 1934 and only 27,423,000 pesetas in 1933. Germany's share in this trade was less affected than that of other countries.

General conditions recently had been hampering business enterprise, even before the present serious troubles commenced. Labour had been very unsettled and exchange difficulties remained serious in spite of clearing arrangements. The following figures giving the value of imports of electrical goods imported last year have been extracted from the recently issued official foreign trade returns, and notes of increases or decreases added. The par value of the peseta, in which values are shown, may be reckoned at about 22 to the £.

	1935. Pes. (000).	Inc. or dec. on 1934. Pes. (000).
Dynamos, motors, fans, alternators, transformers, starters, rheostats and parts up to 5 kg.—		
Total	1,202	+ 34
From Germany	515	+ 49
„ France	112	— 29
„ Switzerland	67	+ 16
„ United Kingdom	136	+ 33
„ United States	248	— 26
„ Italy	71	— 19
Ditto, from 5 to 25 kg.—		
Total	1,043	— 284
From Germany	747	+ 152
„ France	156	— 92
„ Sweden	263	— 56
„ Switzerland	125	+ 35
„ United Kingdom	137	+ 5
„ United States	332	— 370
Ditto, from 25 to 100 kg.—		
Total	943	+ 150
From Germany	395	+ 125
„ France	60	+ 14
„ Switzerland	160	+ 63
„ United Kingdom	93	— 39
„ United States	98	— 64
Ditto, from 100 to 500 kg.—		
Total	1,166	+ 209
From Germany	351	+ 65
„ France	50	— 10
„ Switzerland	290	+ 125
„ United Kingdom	172	— 14
„ United States	101	+ 21
„ Sweden	75	— 30
Ditto, from 500 to 1,000 kg.—		
Total	337	— 84
From Germany	75	— 19
„ Switzerland	77	— 21
„ United States	87	— 34
Ditto, from 1,000 to 3,000 kg.—		
Total	965	+ 260
From Germany	379	+ 211
„ Switzerland	327	+ 189
„ Sweden	78	— 4
„ United Kingdom	75	— 90
„ United States	36	— 64
Ditto, from 3,000 to 5,000 kg.—		
Total	262	+ 3
From Germany	35	— 37
„ Sweden	61	+ 56
„ Switzerland	52	— 68
„ United Kingdom	45	+ 10
Ditto, over 5,000 kg.—		
Total	1,680	— 20
From Germany	327	— 56
„ Switzerland	375	+ 36
„ Sweden	176	— 157
„ United Kingdom	85	— 105
„ United States	488	+ 226
Generating sets and rotary convertors up to 1,000 kg.—		
Total	308	+ 69
From Germany	113	+ 45
„ United Kingdom	50	+ 17
„ United States	35	—
Ditto, from 1,000 to 5,000 kg.—		
Total	259	+ 54
Electric meters, voltmeters, ammeters and electro-medical apparatus—		
Total	1,245	— 139
From Germany	535	+ 34
„ France	131	+ 17
„ Switzerland	310	— 128
Switchboards—		
Total	223	— 121
From Germany	83	+ 19
„ United States	16	— 136
„ United Kingdom	42	*
Heaters, cookers, hot plates, etc.—		
Total	284	+ 70
From Germany	155	+ 37
„ United States	40	— 9
„ Switzerland	71	*
Accumulators—		
Total	453	— 44
From Germany	115	+ 69
„ United Kingdom	85	— 35
„ United States	180	— 23
Dry batteries—		
Total	260	— 26
From Germany	96	+ 5
„ Denmark	118	— 13
Cables, over 1 cm. diam.—		
Total	332	— 2
From Germany	227	+ 24
„ United Kingdom	25	— 10
Cables, not exceeding 1 cm.—		
Total	85	— 34
From Germany	26	+ 8
„ Great Britain	9	*
Insulated wire and cable, less than 0.5 mm.—		
Total	60	—
From Germany	7	— 10
„ United Kingdom	16	—
„ United States	16	—
Telegraph and telephone apparatus—		
Total	9,890	— 6,230
From Germany	1,055	— 15
„ Holland	3,133	— 147
„ United States	3,822	— 688
„ United Kingdom	1,196	*
Lamps, complete—		
Total	750	+ 218
From Germany	368	+ 21
„ Holland	252	+ 182
Switches, circuit-breakers, lamp-holders and lamp caps—		
Total	3,932	+ 1,042
From Germany	1,378	— 147
„ United Kingdom	115	+ 15
„ United States	328	+ 28
Wireless valves—		
Total	1,245	— 178
From Germany	495	+ 65
„ Holland	216	— 24
„ Hungary	115	+ 11
„ United States	673	— 217
Mercury vapour lamps—		
Total	953	+ 723

*Value unspecified in 1934.

Swedish Foreign Electrical Trade

FEATURES of Sweden's electrical trade last year were an increase of between 20 and 25 per cent. in imports, with the accumulator and battery group the only important exception in the advance, and a moderate increase in exports excepting those of telegraph and telephone apparatus, including radio. On the export side Finland, Argentina and Brazil appeared as good customers for power plant in 1935. With regard to imports, the United Kingdom has taken her fair share of the improved trade, although she seems (like Germany) to have lost ground in the cable business. The following statement, based on the official returns, gives the values of the leading items last year, with a note of increase or decrease compared with 1934. The exchange value of the krone is roughly 1s.

EXPORTS

	1935. Kr. (000).	Inc. or dec. on 1934. Kr. (000).
Motors, generators, transformers, and converters—		
Total	12,148	+ 1,193
To United Kingdom	1,816	+ 935
„ Soviet Russia	2	— 40
„ China	276	— 46
„ Iran	266	+ 262
„ Irish Free State	26	— 218
„ Japan	55	— 110
„ Argentina	438	*
„ Brazil	890	*
„ Mexico	299	*
Vacuum cleaners—		
Total	6,698	+ 623
Accumulators, batteries and parts—		
Total	1,441	— 268
Stators, rotors, current collectors, etc.—		
Total	4,881	+ 300
To United Kingdom	862	— 233
„ France	402	— 633
Switches, etc.—		
Total	506	— 381
To United Kingdom	65	— 377
„ Finland	80	*
Telegraph and telephone apparatus—		
Total	5,000	— 3,068
To Italy	340	— 361
„ British South Africa	342	+ 60
„ Poland	1,023	— 1,749
„ India	18	+ 3
„ China	358	*
Insulated wires and cables—		
Total	2,254	+ 276
To United Kingdom	68	+ 48
„ Mexico	207	+ 39
„ China	7	— 147
„ Poland	43	— 69
Finland	285	*

IMPORTS

	1935. Kr. (000).	Inc. or dec. on 1934. Kr. (000).
Metal filament lamps—		
Total	1,135	— 47
To Denmark	136	— 109
„ Norway	133	— 103
„ Irish Free State	181	*
Carbons for electrical purposes—		
Total	313	— 44
To United Kingdom	25	+ 8
„ Norway	120	+ 16
Radio apparatus—		
Total	1,093	— 235
To Finland	508	— 5
„ Brazil	3	— 7
„ Argentina	15	+ 8
„ India	132	*

* Unspecified in 1934.

	1935. Kr. (000).	Inc. or dec. on 1934. Kr. (000).
Batteries, accumulators and parts—		
Total	2,076	— 113
From United Kingdom	448	— 172
„ Germany	699	+ 109
Radio apparatus—		
Total	13,472	+ 2,782
From United Kingdom	2,705	+ 1,135
„ Germany	3,465	+ 485
„ Holland	4,649	+ 409
„ United States	1,543	+ 763
Motors, generators, convertors and transformers—		
Total	5,682	+ 1,542
From United Kingdom	217	+ 67
„ Germany	4,006	+ 906
Stators, rotors, current collectors, etc.—		
Total	723	— 51
From United Kingdom	30	— 4
„ Germany	530	— 75
Metal filament lamps—		
Total	1,510	+ 350
From Germany	802	+ 292
„ Holland	350	— 4
Carbon for electrical purposes—		
Total	2,686	+ 2,206
From United Kingdom	423	+ 48
„ Germany	908	+ 93
Regulating and control apparatus—		
Total	304	+ 151
From United Kingdom	35	+ 22
„ Germany	243	+ 72
Switches, etc.—		
Total	3,570	+ 830
From Germany	2,463	— 22
„ United Kingdom	44	+ 28
Electricity meters—		
Total	1,119	+ 479
From United Kingdom	96	+ 92
„ Germany	853	+ 154
Other electrical measuring instruments—		
Total	803	— 72
From United Kingdom	161	+ 100
„ Germany	505	— 135
Insulated cables and wires—		
Total	4,074	+ 819
From Germany	1,980	— 590
„ United Kingdom	39	— 88
X-ray apparatus—		
Total	436	+ 246
From Germany	411	+ 262
Vacuum cleaners—		
Total	658	+ 231
From Germany	606	+ 200

New Books

The New Acoustics. By N. W. McLACHLAN. Pp. 166; figs. 100. London: The Oxford University Press. Price: 7s. 6d.

It is but little realised that the industry connected with the reproduction of sound is among the largest in the world, as the layman is inclined to think of them as separate units, *e.g.*, telephone systems, wireless, gramophones and talking pictures. However, the acoustic engineer knows better and is always ready to welcome an addition to the very scanty literature available on the subject from a pioneer author, such as Dr. McLachlan.

To the student who is likely to be familiar with contemporary apparatus only, the author's reference to the original type and the forms of its subsequent development must be of the greatest interest, while to electrical engineers and technicians who wish to improve their theory of acoustics the book provides a comprehensive scope for the enlargement of knowledge in every branch of the industry. There is therefore no doubt that this work will be extremely popular.

Foundations of Wireless. By A. L. M. SOWERBY. Pp. 260; figs. 157. London: The *Wireless World*, Iliffe and Sons, Ltd. Price 4s. 6d. net.

This is an elementary text-book on the fundamental principles of receiving circuits, based on a series of articles in the *Wireless World*. No previous knowledge of the subject is assumed and only the very simplest mathematics is employed. The first quarter of the book is devoted to the fundamentals of electricity, as applied to wireless reception, which leads up to the single-valve receiver. From this the student is introduced to the principles of the design and working of modern multiple valve receivers with automatic volume control, working from batteries and from the mains. It is thus a wide field to cover in the space available; that is, from first ideas of electricity to the completion and operation of an up-to-date broadcast receiver, especially with the author's disturbing assumption that the reader may have forgotten what little knowledge of algebra he acquired at school.

Fortunately such a reader is unlikely to tackle a text-book of this sort, and for those who are not quite so non-mathematical in outlook the book should prove an admirable introduction to the theory and practice of wireless reception.

Shorter Notices

"An Outline of Iron and Steel," by A. Allison (Published by H. F. & G. Witherby, Ltd., London. Pp. 191; 20 plates. Price 6s. net), presents a general statement of the manipulation of iron and steel, and references are given to some sources from which full details may be obtained of matters mentioned. It was considered necessary to deal fairly fully with origins so that current conceptions might be more completely understood and future developments visualised.

The eighth edition of "Tables of Physical and Chemical Constants and Some Mathematical Functions," by G. W. C. Kaye and T. H. Laby (published by Longmans, Green & Co., London; pp. 162; price: 14s. net), is now available. In this edition the book has been substantially revised and the tables brought up to date.

"American Electricians' Handbook," by T. Croft. (Fourth edition, revised by C. C. Carr.) Pp. 1,051; figs. and tables. London: McGraw Hill Publishing Co., Ltd. Price 24s. The latest edition of this useful reference book for practical electrical workers has been completely revised in conformity with the 1935 edition of the National Electric Code.

"Television Reception." By Manfred von Ardenne. (Translated by O. S. Puckle.) Pp. 121; figs. 96. London: Chapman & Hall, Ltd. Price 10s. 6d. net.

"Experimental Electricity—Part 1 and 2," by M. M. Das. Pt. 1: Pp. 334; figs. 235. Price 4s. 6d. Pt. 2: Pp. 98; figs. 73. Price 3s. 6d. London: English Universities Press, Ltd.

In the Courts

MR. JUSTICE LUXMOORE, in the Chancery Division on July 31st, delivered his reserved judgment in the action brought by Electrical & Musical Industries, Ltd., and the Boonton Research Corpn. (U.S.A.) against Lissen, Ltd., and Mr. G. Ralis (trading as Andy's Radio Supplies, of Edgware Road, W.) for an injunction to restrain the alleged infringement of letters patent No. 376737 granted to the Boonton Research Corpn. in 1930 for "Improvements in electrical wave amplifying apparatus" and in 1934 assigned by the Corporation to Electrical & Musical Industries, Ltd. The plaintiffs also claimed damages and the usual ancillary relief in a patent action. The reason the Boonton Corpn. were joined as plaintiffs was that if the action succeeded and damages were granted they might, it was stated, go back prior to the date of the assignment of the patent.

There were separate allegations against each of the defendants. So far as Lissen, Ltd., was concerned it was complained that it sold to Mr. Ralis an infringing set together with a pamphlet of directions for operating it; the manufacture of that set and the use of it for testing purposes prior to the sale was also complained of. The truth of these allegations was admitted by Lissen, Ltd. The complaint against Mr. Ralis was the use by way of demonstration of the alleged infringing set and the sale of the set to two persons.

The defence was that the alleged invention was not novel by reason of certain prior documents and prior user, and that it was not useful. There were also allegations of insufficiency of description and ambiguity in the specification with regard to the scope of the monopoly claimed. It was further alleged that a certain statement in the specification was a false representation and defendants counterclaimed for revocation of the plaintiffs' patent.

Mr. Justice Luxmoore, after a hearing lasting twenty-three days, reserved his decision, which was now delivered. In the course of a long elaborate written judgment he said that the case had presented great technical difficulties. Having dealt at considerable length with the expert evidence given at the trial and with the claims in the plaintiffs' complete specification, his Lordship said he was satisfied that at the date of the patent nobody had done what the patentee had done, and that the invention had not been anticipated. Although the question of disconformity had been raised by the defendants, it had not been seriously fought. He came to the conclusion that the plaintiffs were entitled to succeed and to an injunction against both defendants and an inquiry as to damages and for delivery-up of the infringing articles. He gave judgment for both sets of plaintiffs with costs, but he allowed the defendant, Mr. Ralis, costs as against the Boonton Corpn. because the Corporation had not proved that there had been any infringement by Mr. Ralis while the Corporation were owners of the patent. The counterclaim for revocation of the patent would be dismissed with costs.

Upon the application of Mr. Lloyd Jacob, appearing for the defendants, his Lordship stayed, on terms, the operation of the injunction and the inquiry as to damages until the hearing of a possible appeal from the judgment.

Parliamentary News (BY OUR SPECIAL REPORTER)

IN the House of Commons on July 29th Colonel Ropner asked the Minister of Transport whether he was aware that the Central Electricity Board was encouraging local authorities to engage in the commercial business of sea transport: and whether he would make appropriate representations to the Board regarding the undesirability of this practice.

Mr. Hore-Belisha said that so far as the Electricity Commissioners were concerned no new principle appeared to be involved.

Electricity and Telephones

On July 29th Mr. H. Williams asked the Postmaster-General if his attention had been drawn to the fact that in the last five years the number of consumers of electricity had increased by 3,428,957 while the number of users of the telephone had increased by only 605,120; and, under these circumstances, would he consult with representatives of the electricity supply industry with a view to accelerating telephone development.

Sir W. Womersley, Assistant Postmaster-General, said that the circumstances affecting the use of electricity and the use of the telephone were so different that he doubted whether any useful information could be drawn from a comparison between them. He would, however, consider the suggestion if Mr. Williams would communicate with him further about it.

Deaths in Electric Lifts

On July 30th Sir A. Wilson drew the attention of the Home Secretary to two fatal accidents in connection with lifts and asked whether he could yet make any statement as to what, if any, steps were proposed to reduce the increasing number of deaths, mostly of juveniles, caused by, or in connection with, lifts; and what, if any, steps, he proposed to take to bring hotels and residential premises employing over forty persons within the scope of the Factory Acts.

Mr. G. Lloyd said that both accidents were being investigated. Information as to lift accidents on various classes of non-factory premises was being carefully examined, but the Home Secretary was not yet able to state what action would be taken.

Adjournment.

Both Houses of Parliament adjourned on Friday last and will reassemble on October 29th.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Electricity for Dairy Work

At a farmers' conference arranged by E.D.A., which was held at the Royal Lancashire Show, Blackpool, last Friday, Mr. S. Seed, manager of Messrs. W. Green & Sons, agricultural and dairy implement manufacturers, gave an address in which he referred to some of the advantages which farmers can derive from the use of electricity. He said that, for such purposes as cooling milk, water could be pumped automatically at the rate of 1,000 gallons for every one or two kWh consumed, depending on the depth of the well and the height of the tank. Attention was directed to the benefits of refrigeration, by the cold brine or direct expansion methods, for which the consumption was approximately 0.75 kWh per 30-25 gallons of milk per hour. When a cold storage room was incorporated the consumption was about 2 kWh per day for a "room" of 100-150 cu. ft. capacity in normal use. For sterilising utensils a chest heated electrically or by steam raised in an electric boiler was favoured as the most efficient method, the consumption ranging from 7.5 kWh per day for 50 gall. milk output to 8.4 kWh for 100 gall., and 12 kWh for 150 gall.

Midland Apprentices Visit Germany

Eighteen engineering apprentices and students from the Coventry and Birmingham works of the General Electric Co., Ltd., from Messrs. Tangyes, Ltd., and from four other manufacturing companies in the Midlands are spending the first two weeks of August in Germany. According to the programme drawn up by the German State Youth Movement (a copy of which has been sent to us by the Midland Engineering Apprentices' Association) the first five days were to have been spent in Berlin, the German authorities have arranged for the party to study industrial methods and social conditions, youth training system and facilities, &c. The remainder of the tour is to be spent in visiting Munich, Nürnberg, Frankfurt, Wiesbaden and Cologne.

Conditions in Mexico

Although the market is relatively small, the foreign trade of Mexico shows large increases and its potentialities are undoubted. United Kingdom exporters, however, are not securing a wholly satisfactory share of existing business. This is the state of affairs recorded in a report on economic conditions just published by the Department of Overseas Trade. The advantage of proximity enjoyed by the U.S.A., which supplies about 65 per cent. of Mexican imports, can only be countered by the employment of active and competent representatives speaking Spanish fluently, and by a broader outlook as regards credit facilities.

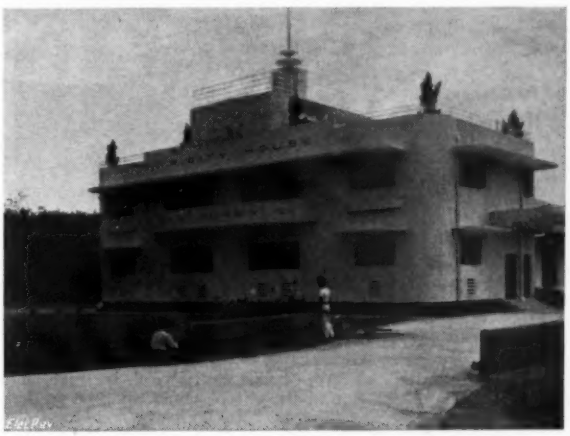
A Fire in the Mersey Tunnel

The electric fire alarm installation in the £8,000,000 three-mile-long Mersey Tunnel had its first real test on July 25th when a lorry carrying cinematograph films from Liverpool to Birkenhead burst into flames. The driver gave the alarm from one of the fire alarm boxes which are situated every 50 yd. throughout the tunnel and within five minutes the Liverpool and Birkenhead Fire Brigades had subdued the outbreak. Special precautions are taken to safeguard the 5,000 vehicles per hour which use the tunnel. An alarm given at any of the ninety-eight special boxes is received at both the Liverpool and Birkenhead Brigade Headquarters. Simultaneously, large neon "Stop" signs in the roof close the tunnel to traffic, while the pay boxes at each entrance are warned by bells and red lights. The "Electro-matic" vehicle-actuated traffic signals are automatically interlocked and allow vehicles to leave but not enter the affected sections of the tunnel. The alarm is also given to the ventilation control room, so that the giant air-fans can be controlled to meet the requirements of the situation. The complete fire alarm installation and the traffic signals were manufactured and installed by the Automatic Electric Co., Ltd.

The West Hampshire Electricity Company's stand at the New Forest Agricultural Show held last week at Lyndhurst

Modern Architecture in Singapore

The premises shown in the accompanying illustration have recently been erected to the order of John Morey & Sons, electrical contractors, of Singapore. The building is a neat example of the modern trend of design in reinforced concrete. A novel feature is that the surface has been finished with a mixture of plaster and broken glass which gives a very beautiful effect when the building is floodlighted at night.



The modern premises of a Singapore electrical contractor

Britannia Loses Her Trident

As a symbol that the British Industries Fair unlocks the trade doors to commercial enterprise and opportunity, a key has been substituted for Britannia's trident in the poster design for the 1937 Fair.

The New Forest Agricultural Show

The display of the West Hampshire Electricity Co., Ltd., earned an award of merit at the New Forest Agricultural Show held at Lyndhurst on July 29th. Much attention was paid by farmers to the comprehensive range of electrical apparatus, which comprised refrigerators and pumping equipment, as well as washing machines and other domestic appliances. In spite of the adverse weather the Show was very successful.

Anglo-Russian Trade Facilities

An agreement was entered into on July 28th between the Export Credits Guarantee Department and the Soviet Trade Representative under which the Department will give guarantees in connection with orders which the Soviet Government organisations are to place in this country up to a total of £10,000,000. These orders are to be placed by September 30th, 1937, and the Soviet Trade Representative has given a formal assurance that it is the intention of the Soviet Government to place orders up to the full limit of £10,000,000. The orders are to be for goods the manufacture of which will give rise to a substantial amount of employment in this country and are not to include any munitions of war.

French Industrial Conditions

After some discussion an agreement has been reached in Paris between the electrical production and distribution industries and the workers of these industries upon the questions of salaries and working conditions. The question of salary is that which is treated at greatest length, and the rules for increases are laid down. These will range from 7 to 15 per cent., according to the pay of the employé, and will be on the basis of the salaries actually paid in May of this year. A provision is made, how-

ever, that in case of the abrogation of the decree laws of last year, which reduced salaries by 10 per cent., the increases arising from this abrogation will take the place of those arising from the wage agreement wherever they are greater. If, however, the salaries so arrived at are still lower than the average salary for the region, additional increases may be granted by a committee composed of representatives of the companies, the employés and the Ministry of Public Works. Provision is also made for the right of the employés to form unions.

The British Empire Exhibition, Johannesburg

A large consignment of "Tangent" electrical products has just been despatched by Messrs. Gent & Co., Ltd., to Johannesburg for the British Empire Exhibition which opens

A lorry-load of "Tangent" clocks and other products about to leave Messrs. Gent & Co.'s works for the British Empire Exhibition at Johannesburg

there next month. Many of the clocks will be installed throughout the Exhibition, both out of doors and inside the actual hall. In addition to clocks, the company's stand itself will display "Tangent" bells, relays, fire-alarm apparatus, luminous call systems and liquid level indicating, recording and alarm apparatus, together with staff locators.

In connection with our note on July 24th (p. 123) concerning the British Thomson-Houston Company's exhibits, the company points out that the range of turbine plant will be represented by a 10-kW geared turbo-generator, transport consideration preventing the display of the larger equipment which is available up to 75,000 kW.

The F.B.I. Business Forecast

The "Business Forecast" published in the F.B.I. "Business Barometer" for the third quarter of the current year states that the domestic boom shows no sign of immediate abatement. Building construction, assisted by steadily expanding orders on rearmament account, continues to provide the main impulse to activity, and for the time being, any decline in house building is likely to be offset by activity in factory and workshop construction. It is still unwise to forecast for more than a few months ahead. Export trade is still disappointing, and recent developments in the international situation afford no grounds for anticipating an early improvement in the general situation. The slackening in the rate of increase of exports, coupled with the rise in imports during the half-year suggests than an over-valuation of sterling in terms of currencies outside the gold bloc countries may be a contributory cause.

Municipal Trading at Walsall

Complaints of unfair trading by the Walsall Corporation Electricity Department were made by Mr. H. F. Truman, at a meeting of the Walsall Chamber of Commerce last week, when he alleged that the department was letting electric water-heaters out on hire at 4s. a quarter. The net cost of installation was £5, and the economic life five years, so that in that period the Corporation recovered the net cost. A percentage of 12½ had to be allowed for maintenance, retail traders' overheads were 20 per cent. and for the Corporation must be higher. Furthermore, considerable financial charges had to be spread over five years. Mr. Truman said that the loss on these heaters was being placed on the price per unit, which meant that the industrial consumers were paying more because of these "ridiculously low" charges. It adversely affected the business of electrical traders. When they quoted an economic price people told them the Corporation would do it much cheaper. It was eventually decided that the matter should be considered by the Retail Section of the Chamber at a future meeting.

Proposed Municipal Showrooms

The Finchley Corporation Electricity Committee reports in favour of the principle of establishing three electricity showrooms in the district..

The Mansfield Corporation Estates Committee has offered the Electricity Committee a site in Regent Street for the erection of showrooms.

Seaham Harbour and Employés' Broken Agreements

Four members of the staff of the Seaham Harbour Electricity Department are stated to have broken their agreements by carrying on private trading in their spare time. In consequence, the Urban District Council has dismissed one of them, another is being suspended without pay for a month and reduced to the status of an electrician, the third is being suspended without pay for two months, and the fourth has been cautioned and reprimanded.

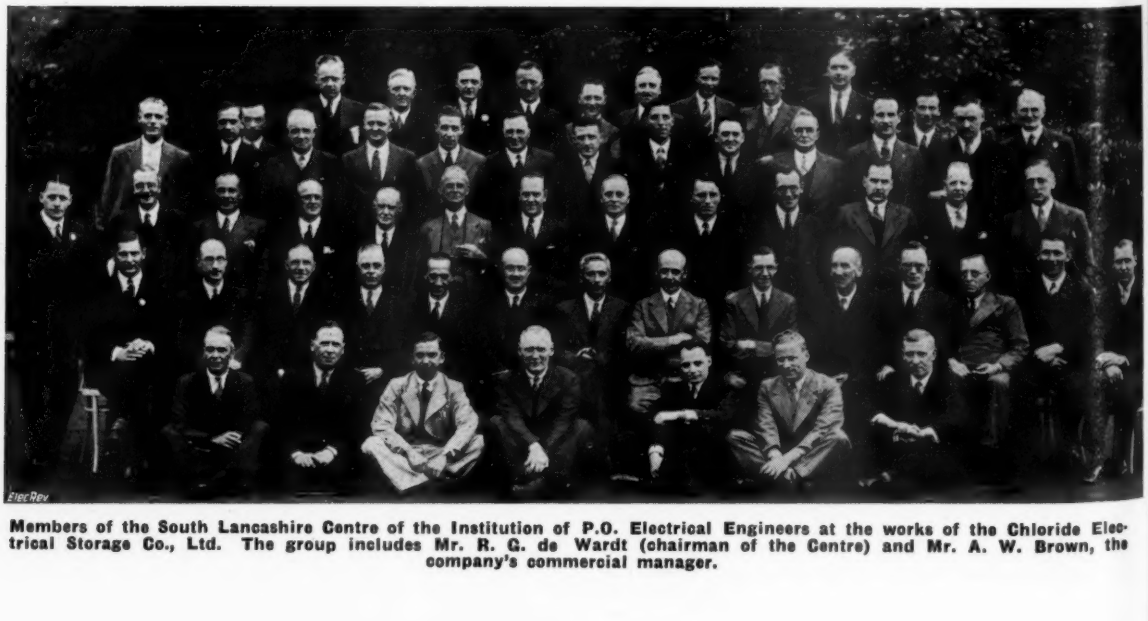
Trade Announcements

Ensign Lamps, Ltd., has closed its branch at 47, Westgate Street, Cardiff, and has opened larger premises at 50, Bridge Street, Cardiff.

The Siemens and General Electric Railway Signal Co., Ltd., informs us that in order to provide greater facilities for its increasing business a modern building has been erected on the G.E.C. Estate at Wembley, which will accommodate Sales and Engineering Departments, and in addition stores, an Experimental Section and a Demonstration Room. From August 10th the address will be East Lane, Wembley (telegrams and cables: Railsilgko, Wembley. Telephone: Arnold 4321). The registered office of the company will remain at Caxton House, Westminster, S.W.

"Spectrum" Lighting for Shop Windows

Following its success at the new Dolcis shoe store in Oxford Street, London, W.1 (see ELEC. REV., May 1st, p. 646), the Franco-British Electrical Co.'s recently developed system of "Spectrum" lighting has just been installed in the window of Messrs. Bertoni, hairdressers, Denman Street, Shaftesbury Avenue, London. In this case the electric discharge tubes, which are mounted behind the glass diffusing screen, are arranged in a combination of straight and wavy lines, this giving an even softer and more evenly diffused illumination



Members of the South Lancashire Centre of the Institution of P.O. Electrical Engineers at the works of the Chloride Electrical Storage Co., Ltd. The group includes Mr. R. G. de Wardt (chairman of the Centre) and Mr. A. W. Brown, the company's commercial manager.

than in previous installations that we have seen. Forming a border to the window the lighting displays all within clearly and in its true colour values, and by altering the balance between the primary and rectifying tubes it is possible to obtain a wide gradation of colours. In spite of an increase in light value, current consumption is claimed to be lower than with ordinary filament lamps.

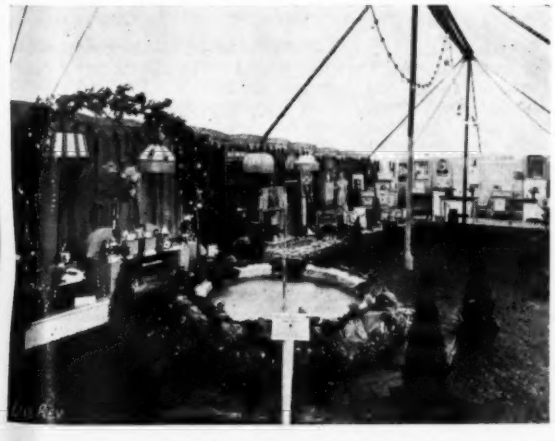
A Decorated Van at Barnsley

An effectively decorated van arranged by the local Electricity Department in the form of a small two-roomed house took part in a recent procession at Barnsley following the crowning of the Carnival Queen. The display was fixed on the chassis of one of the Department's 10-cwt. service vans, the body of which had been previously removed. One side pointed out how electricity could be of assistance in the kitchen, while the other, depicting a bathroom with figure in a foam bath, invited the public to "open the door to domestic hot water and use electricity." Various placards, not forgetting a plentiful sprinkling of "I'm Electric" figures, all over the vehicle contained other reminders of the merits of electricity. During each day of the carnival week the van stood in the market place, and Mr. E. A. Barker, the borough electrical engineer, tells us that it proved a great attraction.

The decorated van of the Barnsley Electricity Department at a recent local carnival

The Eastbourne Flower Show

In our last issue we reported that the Eastbourne Electricity Department's stand was awarded a gold medal for the most outstanding display in its class at an electrical exhibition held on July 22nd and 23rd in the Manor Gardens in conjunction with the Eastbourne Flower Show. We now reproduce a photograph received from Mr. J. K. Brydges, the borough electrical engineer, showing the Department's exhibit. The fountain seen in the picture was made by the Department, and had a colour-changing scheme of lighting beneath the water, and advantage was taken of the display to give advice to those interested in installing electric fountains in their gardens. The rock-work garden was carried out by a local firm of gardening experts.



The Eastbourne Electricity Department's display at the local flower show

Air-conditioning for Existing Hotels

Bull Motors inform us that their "Super Silent" motors are used in the air-conditioning equipment at the Savoy and Berkeley Hotels, London, described in our last week's issue (p. 147).

Orders Recently Booked

Messrs. Yarrow & Co., Ltd., have received the order from the London Passenger Transport Board for the supply of sixteen Yarrow land-type boilers, complete with mechanical stokers and other auxiliary plant, for the Board's power station at Greenwich. This is a repeat order, as the last plant extensions at Greenwich included ten Yarrow boilers which were supplied a few years ago.

Astralite Electrical Products has received the order for the whole of the materials to be used in the autumn illuminations at Swansea. The equipment includes a large quantity of Astralite festoon holders, and inside coloured decoration lamps with 7.029 twin cables, &c.

A National Lighting Campaign

An appeal designed to impress upon existing users of electric lighting that better light means preservation of eyesight and better health is the main objective of the 1936 Lighting Campaign now being organised jointly by the British Electrical Development Association and the Electric Lamp Manufacturers' Association. In the preliminary programme just issued, brief details are given of the proposed Press advertising, area conferences, window displays, lectures, demonstrations and exhibitions, as well as the publicity materials available. Four thousand qualified opticians are also joining in the campaign by preparing suitable "Better Light—Better Sight" window displays. The complete programme, containing dates, details and illustrations of the various publications, &c., will be ready for circulation by E.D.A. early in September.

Good use was made of the back of a large model Revo electric cooker which was one of the novelties of the recent Lincoln Carnival

Opportunities in Poland

British goods have never been so popular in Poland as they are to-day. A report just issued by the Department of Overseas Trade on economic conditions in the country states that the interest shown in British goods and all things British is manifestly greater, but import restrictions are proving a hindrance to further expansion.

Prices of Materials

Messrs. Henry Gardner & Co., Ltd., report, August 5th: No change in the price of copper bars (best selected), sheet and rod, and English pig lead. Spelter, £13 17s. 6d., 2s. 6d. dec. English block tin, £185 5s., £5 15s. inc.

Messrs. Frederick Smith & Co. report, August 5th: Electrolytic copper bars, £42 10s., 5s. inc. Ditto, ditto, wire rods, £48, 5s. inc. No change in the price of electrolytic copper h.c. wire and silicium bronze wire.

Messrs. Edward Till & Co. report, August 5th: No change in the price of India rubber, Para fine.

New Catalogues and Lists

Caird, Chandler & Co., Ltd., 29, Great St. Helens, London, E.C.3.—A catalogue of drying and airing cabinets.

Marconiphone Co., Ltd., Radio House, Tottenham Court Road, London, W.1.—A complete list of radio batteries.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—New pamphlets dealing with metal-clad switchgear, automatic synchronising equipment, induction type over-current relays, all-insulated switches, air-break switches, fuses and plugs and domestic water-heaters. To celebrate the company's jubilee this year a brief historical outline has been published.

Siemens Electric Lamps & Supplies, Ltd., 38/39, Upper Thames Street, London, E.C.4.—"Benjamin" reflector fittings and lighting specialities are the subject of a new catalogue.

Gordon Equipments, Ltd., 25, Milton Street, London, E.C.2.—A catalogue of "Hobart" and "Gordon" battery shop tools and equipment.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, London, W.C.2.—A catalogue of type "B" lamps.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A well illustrated 44-page art booklet dealing with industrial vacuum cleaners.

Rawlplug Co., Ltd., Cromwell Road, London, S.W.7.—A catalogue of "Rawlplugs," fixing tools, enamels, solders, &c.

Bankruptcy Proceedings

J. R. Webb, 35, Kelston Road, Whitchurch, electrical contractor, lately 429, Bradstock Road, Stoneleigh Park, Ewell, Surrey.—The receiving order was made on a creditor's petition, and the debtor has now lodged a statement of affairs which shows gross liabilities of £3,381, of which £1,041 is expected to rank for dividend, with net assets of £372, leaving a deficiency of £669. The debtor attributes his failure to loss on trading at 53, Cardiff Road, Bargoed, to bad debts, ill-health of his wife and to losses as guarantor in respect of money advanced and goods supplied to certain limited companies.

C. W. Prosser, electrical engineer, trading as Prosser Bros., 81, Woodside Street, Cinderford, Glos.—This debtor filed his own petition, and has recently returned a statement of affairs showing ranking liabilities of £245, with net assets of £29, leaving a deficiency of £216. He attributes his failure to ill-health, lack of capital, keen competition and local depression.

J. R. Scattergood, radio dealer, 84, Uxbridge Street, Burton-on-Trent.—First meeting August 11th at 22, Regent Street, Park Row, Nottingham. Public examination September 30th at the Court House, Burton-on-Trent.

J. E. Lander, electrical and radio engineer, 26, Union Street, and 12, School Road, Newton Abbot.—Application for discharge to be heard on September 18th at the Castle, Exeter.

G. W. Lambert, electrician, 3, Ontario Street, Southwark, S.E.—Discharge suspended for three months until October 3rd.

A. Harrison, electrical engineer and contractor, 110, Town Street, Horsforth, near Leeds.—Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver, released July 9th.

J. Webster, electrical and radio engineer, 65, Moss Lane, Orrell Park, and 231, Warbreck Moor, Aintree, Liverpool.—Trustee, Mr. C. E. Balmforth, 719, James Street, Liverpool, released June 24th.

L. E. Pearce (St. John's Electrical Co.), electrical engineer, 48, St. John's Road, Tunbridge Wells.—Trustee, Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, released June 11th.

W. S. Hart, electrician, 34, Arthur Street, Portsmouth.—First and final dividend of 8d. in the £, payable August 10th at 87, High Street, Portsmouth.

Company Liquidations

Vale & Hardy, Ltd., Roslyn Works, Roslyn Road, Tottenham.—The statutory first meetings of creditors and shareholders under the compulsory liquidation of this company were held on July 31st at the Board of Trade Offices, Carey Street, W.C., before Mr. H. P. Naunton, Senior Assistant Official Receiver. The company was registered as a private company in May, 1935, and traded at the outset as the Union Folding Box Company. A large portion of the business was the supplying of cardboard boxes to battery manufacturers who ceased business in August, 1935. The directors thereupon, in order to preserve the box business, began to manufacture batteries in the name of the Phœnix Battery Co., the two businesses being carried on side by side at Roslyn Works. Early this year the company received complaints in respect of batteries due to faulty materials being supplied, and goods to the value of £800 were returned by customers. An action was started against the suppliers of the materials, but was not proceeded with, and the company ceased business in March, 1936. The failure of the company was attributed to loss by fire and faulty batteries; also to excessive commission paid to travellers. No statement of affairs was lodged, but it appeared that the liabilities amount to about £2,000, and that the only assets were seized and sold under a distraint by the landlord last May. The liquidation was left in the hands of the Official Receiver.

Picton Electrical Patents, Ltd., Bowrons Avenue, Wembley, and 4-5, Broad Street Place, E.C.—The statutory first meetings of creditors and shareholders under the compulsory liquidation of this company were held on July 28th at the Carey Street offices of the Board of Trade, Lincoln's Inn, W.C. Mr. H. P. Naunton, Assistant Official Receiver, reported that the company was formed in July, 1935, to acquire from Mr. Joseph Picton certain British letters patent granted in respect of an electrical device which he had invented and to carry on business as manufacturers of electrical rectifiers. The company was handicapped throughout by lack of funds and apparently did not find the Picton rectifier readily marketable. About the end of April Mr. Picton, being thoroughly dissatisfied with the financial position of the company, presented the petition to wind up the company. The accounts lodged under the liquidation showed liabilities of £1,479 against assets of £425 and an issued capital of £1,813. The failure of the company was attributed to insufficient and unsatisfactory arrangements made for providing the company with capital. The liquidation was left in the hands of the Official Receiver.

Anson & Hopwood, Ltd., wireless manufacturers and dealers, 84, Chancery Lane, W.C.—Under a compulsory winding up order made against this company last June upon the petition of creditors, the statutory first meetings of creditors and shareholders were held on July 28th at the Board of Trade Offices, Carey Street, W.C. The accounts lodged showed liabilities £3,349 against assets £536, and an issued capital of £5,800. The failure of the company was attributed to disputes between the promoters and to insufficient working capital. A resolution was passed for Mr. A. E. Attwood to act as liquidator with a committee of inspection.

Chiswick Electricity Supply Corporation, Ltd.—Particulars of claims by August 31st to the liquidator, Mr. O. W. Williams, 796, Salisbury House, London Wall, E.C.2.

Private Arrangement

M. Franks, electrical and radio engineer, Arcade Road, Littlehampton, Sussex.—A meeting of creditors was held recently at the offices of Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, when a statement of affairs as at July 17th was presented which disclosed liabilities of £1,208, of which £840 was due to trade creditors. There was an unsecured cash creditor for £150, while a partly secured creditor ranked for £218. The assets were estimated to produce £205, from which had to be deducted preferential claims of £33, leaving net assets of £172, or a deficiency of £1,036. The unsecured cash creditor had undertaken to withdraw his claim provided the matter was not dealt with in bankruptcy. At the previous meeting the creditors desired that the matter should be dealt with under a deed of assignment providing arrangements could be made for debtor's brother to purchase the business at a fair figure, and it was decided that the meeting be adjourned for debtor's brother to make an offer. At the adjourned meeting held on July 27th, debtor's brother offered to purchase the stock and fittings for £30, to release the motor van for the benefit of the creditors, and to pay the rent and other outgoings in respect of the premises from June 17th last, the date on which he took possession. The matter was considered, and it was decided that the offer should be accepted, and the estate should be dealt with under a deed of assignment to Mr. A. E. Orbell, as trustee, with a committee consisting of the representatives of Messrs. J. J. Eastick & Sons, Drake & Gorham (Wholesale), Ltd., and Mr. Charles Latham, representing creditors.

Electricity Supply

Lighting, Domestic, Power

Australia.—BRISBANE.—The City Council has decided to negotiate for the acquisition of the City Electric Light Co.'s undertaking, states the *Electrical Engineer and Merchandiser*. This action is to be taken in accordance with the present Labour Council's opinion that the Council should be the sole generating and supply authority in Brisbane and the surrounding districts. It has been precipitated by the fact that the first of the company's franchises, that for the South Brisbane area, expires this month. The Council is anxious to take over each franchise as it expires, but is in a difficulty owing to a recent legal interpretation concerning the range and value of the assets involved in supplying each area, under which the cost to the Council is likely to be excessive. The matter would be simplified if the Council could arrange to take over the undertaking as a whole.

Barking.—ELECTRIC-DISCHARGE LIGHTING.—The Highways Committee is to install a system of electric-discharge lighting in Longbridge Road; the cost will be £380.

INSTALLATIONS IN FLATS.—Electricity is to be installed in Council flats at a cost of £909.

NEW SUB-STATION.—At a cost of £1,472, the Electricity Committee is to erect a sub-station in Levett Road.

CABLE LAYING.—Electric cables are to be relaid in River Road at a cost of £2,850.

Bexhill-on-Sea.—POSSIBILITY OF ABSORPTION RETARDS PROGRESS.—It was stated at a recent meeting of the Council that it had been intended to introduce a two-part tariff, but for two or three years this would result in a loss of revenue, and it was obvious that they did not wish to lose money and to hand over the fruits of the loss to whatever undertaking might absorb them. It was decided only to offer a two-part tariff to consumers guaranteeing an all-electric house (allowing one coal fire).

Blaydon-on-Tyne.—EXTENSIONS.—The North-Eastern Electric Supply Co., Ltd., is to lay a 20,000-V cable from Spa Well to the district boundary and another cable with combined pilot and telephone line from Derwenthaugh Angle to Hagg Hill.

Brighton.—SURGE ABSORBERS.—The Electricity Committee is to install surge absorbers to protect overhead lines against lightning at a cost of £1,750.

LOANS.—Application has been made for sanction to a loan of £100,000 for mains and house services, and £15,000 for apparatus on hire.

SUB-STATION.—A sub-station is to be erected and equipped at Varndean at a cost of £3,010.

Bristol.—THERMAL-STORAGE HEATING.—The new civic buildings, the plans of which are being considered by the Corporation, are to be provided with an electro-thermal storage system for heating.

Bromley.—MANY MORE CONSUMERS.—Notable progress has been made during the past year by the Electricity Department, of which the engineer is Mr. W. G. Trend, 2,273 additional consumers having been connected. Part of this is due to electrification work on the Downham estate, where cables were laid in all roads, the houses being wired by the London County Council; at the end of the year 614 dwellings out of a possible 745 had been connected, and 115 of the tenants had hired an electric cooker from the Department. Advantage was taken in general of the hiring facilities, and an additional 670 cookers and 136 wash-boilers were let out on hire, bringing the totals on hire to 1,940 (one to every six consumers) and 355 respectively. There was also a very satisfactory rise in the amount of electricity sold, namely, from 10,338,814 kWh to 13,455,772 kWh, an increase of 30 per cent.

Canada.—TORONTO.—Last year, for the first time, the annual revenue of the Toronto hydro-electric system exceeded that of 1930, and at $12,767,824 it reached the highest amount in the twenty-four years of operation by the Commissioners. Sales amounted to 923.5 million kWh, against 880.6 millions in 1934, the connected load being 1,119,629 h.p., as compared with 1,090,136 h.p. in the preceding year. It is also satisfactory to note that expenses of operation and management were further decreased by $22,932.

Cheadle and Gatley.—SALES EXPAND.—Mr. R. W. Willis, the electrical engineer to the Urban District Council, informs us that the total kWh sold by the undertaking in 1935-36 was about 28 per cent. more than in the previous year.

Chester.—FACTORY SUPPLY.—A proposal has been made by the Electricity Committee to borrow £8,500, the estimated cost of affording a supply of electricity to the Reliance Works.

Cornwall.—LOWER CHARGES.—The Cornwall Electric Power Company, which serves practically the whole of the county, has announced a reduction in prices as from July 1st. The domestic two-part tariff running charge and the farming rate are reduced to 1d. per kWh. The business rate remains at 1d. per kWh and the service charge is reduced from 30s. to 20s. per 100 W, the minimum charge now being £4 per year instead of £6.

Croydon.—LOWER BULK-SUPPLY CHARGE.—The Electricity Committee recommends reducing the charge for high-voltage bulk supplies to large stores from £6 to £5 10s. per kW per annum.

Finchley.—EXTENSIONS.—Mains extensions are to be carried out by the Electricity Committee at a cost of £2,300.

LOANS.—Sanction has been obtained to a loan of £8,527 for mains, £13,580 for sub-station equipment and £15,060 for meters.

Gateshead.—SUPPLY SCHEMES.—Approval has been given by the Town Council to plans by the North-Eastern Electric Supply Co., Ltd., for laying cables in various streets, while the Council proposes to install electricity in houses at Old Fold and the Teams district.

Glantawe.—POWER STATION CLOSED.—The South Wales Electric Power Co. having become the statutory undertaking in the Ystradgynlais area, the Glantawe power station has been closed.

Guildford.—COURAGE REWARDED.—When the Electricity Committee reduced the running charge under its all-in tariff to ½d. it realised that if all of its consumers changed over to this tariff and used no more electricity than hitherto a heavy loss far exceeding the available surplus would have been inevitable. The result, however, justified the risk, for although in 1934-35 the Electricity Department (electrical engineer, Mr. W. E. Affleck) established a record increase in sales of 2½ million kWh this was far eclipsed in the past year by an expansion of nearly 5 million kWh. At March 31st last there were 13,187 consumers (increase of 1,206), and the Department had on hire 3,294 domestic appliances (1,099 increase).

Hull.—PLANT EXTENSIONS.—The Hull correspondent of the *Financial Times* reports that the Electricity Commissioners have sanctioned the borrowing of £279,220 for extensions to the Corporation's power station, and £150,000 for mains and services. Details of the tenders accepted in connection with the station extensions are given in our "Contracts Closed" section.

Ilford.—CORONATION LIGHTING.—The Corporation has approved a scheme for Coronation floodlighting and illuminations which will cost £750.

Kingston-upon-Thames.—TRADING RESULTS.—Sales of electricity during the year ended March 31st last amounted to 15,823,207 kWh (23 per cent. increase). There were further reductions in prices during the second half of the financial year, which partly accounts for a fall in the gross profit. Revenue, at £84,768, was up £1,097, while expenditure rose by a larger amount to £70,219. After meeting loan charges and other items there remains a net profit of £3,245, which, with a balance unappropriated from last year, leaves £11,938 available for allocation. According to the revenue account there is a bank overdraft of £13,998. This, states Mr. A. R. Norris (the borough treasurer) arises, among other things, from the reduced profit, utilisation of unappropriated profits of previous years and the heavy stock of materials carried.

Leeds.—LOANS.—Sanction to borrow £24,000 for switchgear and £50,000 for sub-station equipment is being sought by the Electricity Committee.

Lichfield.—SUPPLY NEGOTIATIONS.—The Electricity Committee has arranged terms for a supply with Messrs. J. & C. H. Evans, who are installing additional machinery, and also with the Staffs Water Co. for a new pumping station at Hanch.

London.—J.E.A. FINANCES.—At a recent meeting of the London and Home Counties J.E.A. it was reported that the total income of the Authority's local distribution undertakings in Surrey and South Middlesex during the year ended March 31st last was £783,842, as compared with £648,764 in the previous year. Expenditure amounted to £798,910, as compared with £639,621, and the net deficit on the year's working was £15,068, as compared with a net profit for the previous year of £9,143. This is after putting aside during the year £154,892 for repayment of capital and £153,675 for payment of interest on stock issue, &c. Against the deficit should be placed the "lag" in revenue representing the electricity consumed during the latter part of the financial year, but not charged until the early part of the new financial year.

WOOLWICH.—The L.C.C. is to renew the electric lighting at the Brook Hospital, Shooter's Hill, at a cost of £10,400.

Loughborough.—SUB-STATION.—A site for a sub-station has been acquired by the Gas and Electricity Committee.

Manchester.—PURCHASE OF NEW SUPPLY AREA.—The Electricity Committee has arranged terms for the purchase of that portion of the undertaking of the Altrincham Electric Supply, Ltd., which is in the city area.

Mountain Ash.—CHEAP ELECTRICITY.—Mr. E. W. Jones, the general manager of the Electricity Department, informs us that a report on charges has been adopted by the Electricity Committee. For the June quarter the net lighting flat rate was 2d. per kWh, and it was proposed that the same rate should apply for the September quarter. However, the preliminary figures for the year ended March 31st last had been examined, and the results were such that it was decided to recommend a net rate of 1½d. for the quarter. Notwithstanding these low rates, the Committee anticipates that it will be able to recommend a net rate of ¾d. per kWh for the December quarter, as last year.

Newcastle-under-Lyme.—COOKERS FOR 5s. PER ANNUM.—Electric cookers in two sizes (4-5 and 6-7 persons) are now hired out by the Electricity Department at the very low rate of 5s. per annum, wash-boilers being available for a similar amount, and water-heaters for 10s. per annum. Mr. A. J. C. DeRenzi, the borough electrical engineer, informs us that in 1935-36 the Department experienced a very good year, and, following usual procedure, the profits are being handed over to the consumers in the way of lower tariffs and by reducing the hire charges for cookers and water-heaters, with the idea of making a real effort to increase sales in this direction, in spite of the fact that the Department will undoubtedly have to bear the cost of the apparatus, and the nominal hire charge will, he anticipates, only cover upkeep and maintenance. The Department's output increased by approximately 40 per cent. in the past year, and although to a considerable extent this was accounted for by two fairly large power consumers, very substantial progress was also made in sales for heating and cooking, which Mr. DeRenzi hopes to increase by 50 per cent. during the present year.

OPPOSITION TO MCGOWAN RECOMMENDATION.—Recently the Town Council passed a resolution protesting against the recommendation of the McGowan Committee that undertakings with outputs of less than 10,000,000 kWh per annum should be amalgamated with larger ones. It has now been decided to convene a meeting of affected undertakings in Staffordshire on August 18th, and later it is hoped to call a similar meeting for the whole country. At a meeting of the Council last week Mr. DeRenzi said it was difficult to understand how the McGowan Committee, after stating in Clause 130 that it was "neither equitable nor practicable to prescribe what particular undertakings or even size of undertaking shall be amalgamated," could reconcile this with the recommendation in Clause 149 (b) that all undertakings selling under 10,000,000 kWh per annum should be compulsorily acquired. The Electricity Committee placed on record the view that efficient and sound administration and not merely size was the only basis on which the objects aimed at could be achieved.

REDUCED CHARGES.—The Town Council has reduced the charge for lighting through slot meters from 4½d. to 4d. per kWh, and the alternative rate for lighting from £8 to £6 per kW per annum.

Rotherham.—PLANT EXTENSIONS.—The Central Electricity Board has directed the Corporation to make extensions to the electricity works, which will involve an outlay estimated at £195,000. These comprise the installation of steam-raising plant and the erection of the necessary building and civil engineering works, the whole to be ready for commercial operation by September, 1937.

Sheffield.—LARGELY INCREASED CONSUMPTION.—During the year ended March 31st last the Electricity Department sold 404 million kWh against 316 million kWh in the previous year, an increase of 28 per cent. Additional consumers numbered 8,627, bringing the total to 143,810. The year's working shows a net surplus of £117,795. The total revenue was £1,259,859 and the total working costs £710,222.

MAINS EXTENSIONS.—The Electricity Committee has approved extensions of mains, &c., involving an outlay of £7,901.

Stoke-on-Trent.—LOAN SANCTIONS.—The Electricity Commissioners have sanctioned the borrowing of £2,000 for mains in connection with the change-over in Moorland Road, Burslem, and £1,400 for a sub-station building in Belmont Road, Etruria.

SUB-STATION WORKS.—The following decisions have been made with regard to sub-stations: New low-voltage switchgear to be provided for Pinnox Street sub-station, Tunstall; sanction to be sought for £1,850 for sub-station at Townsend, Bucknall; design for Anchor Road sub-station approved.

EXTENSIONS.—An additional supply is to be afforded to the United Co-operative Laundry and extensions carried out to an estate at Meir, to 134 houses to be erected in Whieldon Road and Regent Road, Fenton, and to 140 houses to be erected in Sneyd Green. Messrs. Twyfords, Ltd., Cliffe Vale, are to receive an additional supply, while that to Smallthorne is to be improved.

South Shields.—FINANCING EXTENSIONS.—The Town Council is to apply for sanction to take £10,000 from the reserve fund for mains; if this is refused it is proposed to ask to borrow the amount.

ELECTRICAL INSTALLATIONS.—Electricity is to be installed by the Town Council in houses to be erected at Harton Colliery, Commercial Road and Cornwallis Square.

Staveley.—RURAL EXTENSIONS.—Following representations made by the South Westmorland Rural District Council regarding the erection of overhead low-voltage lines from Windermere to Staveley, the Windermere Electricity Co. has agreed to lay the mains underground in the same trench as the high-voltage cable, providing cottages and the village of Staveley can be supplied from an overhead line.

Stirling.—ANNUAL STATISTICS.—A copy of the report on the working of the electricity undertaking for the year ended May 15th last has been sent to us by Mr. W. R. Murray, the burgh electrical engineer. This shows that 3,806,328 kWh was sold, against 3,294,516 kWh in the previous year (16 per cent increase), the maximum demand rising from 1,819 kW to 2,479 kW. Revenue amounted to £25,597 and expenditure

to £21,381, leaving a surplus of £4,216. After meeting certain charges there was a deficit of £1,253.

Sunderland.—CORRECTION.—We regret that in our last issue a paragraph which should have appeared under "South Shields" was in error entitled "Sunderland." Alderman J. R. Curbison's notice of motion there referred to was the subject of discussion at South Shields Town Council meeting on July 29th, and his proposal for the setting up of a committee of inquiry was deferred till September 30th.

Sweden.—OPENING OF NEW HYDRO-ELECTRIC POWER STATION.—The big hydro-electric power station at Krängede, on the Indalsaelven River, has been inaugurated by H.R.H. Gustaf Adolf, Crown Prince of Sweden, states *Reuter's Trade Service* from Stockholm. Construction of the Krängede station began in January, 1931. The station can now yield 60,000 kW, but, by fitting a third set of turbines and generators, an additional 30,000 to 40,000 kW can be produced, and there are possibilities of expansion in the future to 180,000 kW.

ELECTRICAL CONCESSIONS.—An expert commission has now placed before the Swedish Board of Trade its report and proposals concerning the control of high-voltage works. Recommendations are made in favour of the extension of the period of concessions from the maximum of forty to sixty years and for the supervision of these works and of low-voltage installations.

Tynemouth.—REDUCED HIRE CHARGES.—The present charge of 6s. per quarter for the hire of a cooker is being reduced by the Electricity Committee to 3s. 6d., 4s. 6d. and 5s. 6d., according to type.

Uttoxeter.—LOWER CHARGES.—Reductions in charges have been authorised by the Council. The lighting flat rate will be ½d. per kWh less, and for slot meter supplies (not assisted wiring) the discount is to be increased from 1d. to 1½d. in the shilling. No meter rent is to be charged on assisted-wiring accounts. The shop-lighting rate is being reduced from 7s. 6d. to 6s. 6d. per quarter per 100 W, while under the rateable-value tariff the minimum standard charge is being reduced from 25s. to £1, the first 240 kWh being charged at 1½d. and the remainder at 1d. per kWh.

Whitley Bay.—ILLUMINATIONS INQUIRY.—The district auditor recently held an inquiry into the spending of £1,268 on illuminations last year by the Whitley and Monkseaton Urban District Council. Mr. Magrath said he could not accept the statement of the clerk that the expenditure was incurred under the Health Resorts and Watering Places Act, 1921, which empowered local authorities to advertise health resorts and watering places. On behalf of the Council it was stated that many people came to Whitley Bay to see the illuminations and about 60 per cent. of the inhabitants earned their living by accommodating visitors. Without illuminations very few resorts could be competitive. Mr. Magrath announced that his decision would be made known later. If the decision is against the Council the members are to appeal to the Ministry of Health.

Traction

Bolton.—MOTOR-BUSES OR TROLLEY-BUSES?—Councillor W. Bradley, chairman of the Transport Committee, stated last week that a decision would soon have to be reached as to what was to be the alternative to trams, namely, motor-buses or trolley-buses. The cost of electricity would largely influence the Committee as to its future policy. The adoption of the trolley-bus would mean an increase in the consumption of electricity equal to 20 per cent. for equal mileage as compared with trams.

France.—RAILWAY ELECTRIFICATION PROGRESS.—Work on the electrification of the line from Paris to Le Mans, a distance of 212 km., is now in progress. Along part of the way the work is progressing on four tracks, while for the remainder of the line only two tracks are to be electrified. The contact wires themselves are of 107 sq. mm. section cadmium copper and are provided with counterweights for tensioning.

Great Britain.—FURTHER LONDON TRAM SERVICES CONVERTED.—Last Sunday trolley-buses were introduced between North Finchley and Edgware and between Hammersmith and North Finchley, tram services 45 (Cricklewood Broadway to Whetstone) and 60 (Paddington to North Finchley) being displaced.

Ramsgate.—UNDERGROUND RAILWAY OPENED.—The underground railway at Ramsgate which will save visitors nearly a mile walk to and from the sands has been opened by the traffic manager of the Southern Railway. The ceremony took place at the new station of Hereson on Saturday.

South Shields.—TRANSPORT FINANCES IMPROVE.—During the past year the transport undertaking, which since last autumn has been under the general managership of Mr. H. Muscroft, earned a larger surplus (£6,981) than in any of the thirty years of its operation. The number of passenger journeys rose by 3.53 per cent. to 18,107,646, against an increase in mileage of 1.49 per cent. Of the total revenue of £85,681 (£81,909 in 1934-35) £70,914 was derived from the tramways, the expenditure on which amounted to £52,575, excluding interest charges. Bus revenue was £14,767 and expenditure £10,331. Comparative data for the two types of transport are given in the annual report as follows (bus figures in parentheses): Passengers carried, 16,090,982 (2,016,664); receipts per vehicle mile, 15.13d. (9.66d.); working expenses per vehicle mile, 11.07d. (6.76d.); cost of power per vehicle mile, 1.71d. (1.40d.); average fare per passenger, 1.02d. (1.71d.); average passengers per car mile, 14 (5); number of vehicles in stock, 40 (10); average speed, 7.73 (11.13) m.p.h.; maximum 1d. fare distance, 2.07 (1.06) miles; average fare charged per mile, 0.59d. (1.27d.). A scheme for the introduction of trolley-buses was authorised during the year, and the first route is expected to be in operation by the end of September next.

Uruguay.—TRANSPORT UNIFICATION.—It is reported in the *Review of the River Plate* that a project for the unification of passenger transport services in Montevideo has been presented to the Transport Committee of the municipality. The idea is to form a consortium between the municipality and the Sociedad Comercial de Montevideo to exploit the existing tramways and omnibuses, and also to establish special trolley-bus services. The Sociedad Comercial de Montevideo would undertake to acquire all the rolling stock of the omnibus companies and to retain their present personnel.

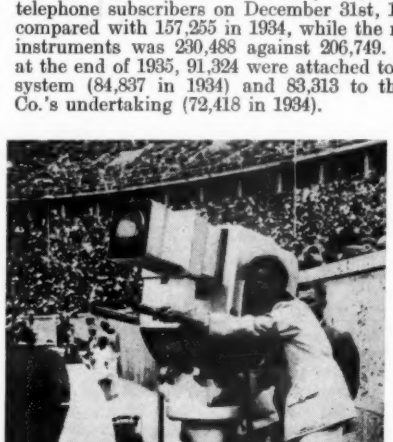
Communications

Edinburgh.—LEITH AREA NOW AUTOMATIC.—The manual telephone exchange in the Leith area having been superseded by automatic equipment, Edinburgh now has 24,349 subscribers' lines automatically controlled.

Great Britain.—PHOTO-TELEGRAPHY.—A public photo-telegraphic service is now in operation between Great Britain and Czechoslovakia. The maximum dimensions are 13 by 18 cm., the charge up to 120 sq. cm. being £1 12s. 6d. and over this size £2 7s. 6d.

EXTENDED TRANSATLANTIC TELEPHONY ZONE.—The Postmaster-General announces that the first (lower-rate) zone in the telephone service with Transatlantic liners has been extended in a westerly direction from longitude 18 deg. W. to longitude 35 deg. W.

Poland.—TELEPHONES.—A report on economic conditions, just issued by the Department of Overseas Trade (Stationery Office, price 1s.), states that a new telephone tariff was introduced in December, 1935, by which the subscription rates for ordinary house instruments were reduced by about 13 per cent. and for office telephones by about 9 per cent. This reduction became effective as from January 1st, 1936. The number of telephone subscribers on December 31st, 1935, was 174,637, as compared with 157,255 in 1934, while the number of telephone instruments was 230,488 against 206,749. Of the subscribers at the end of 1935, 91,324 were attached to the State telephone system (84,837 in 1934) and 83,313 to the Polish Telephone Co.'s undertaking (72,418 in 1934).



A television camera transmitting one of the events during the Olympic games in Berlin

BROADCASTING.—The same report gives the number of radio receiver licences at December 31st, 1935, as 491,823, compared with 374,047 at the end of 1934. Very few radio instruments are imported complete, but considerable business is done in chassis and parts imported and assembled locally. Practically all valve receivers now sold have three wavebands. As the duty is based on weight and is high, most of the chassis and parts imported are as light as possible.

South Africa.—NEW BROADCASTING CORPORATION.—Broadcasting in the Union was taken over from the African Broadcasting Company on Sunday by the South African Broadcasting Corporation established under the Act passed by Parliament last Session. So far as listeners are concerned there is no change, and the staffs of the broadcasting stations have all been re-engaged. The board appointed by the Governor-General under the terms of the Act met for the first time at Johannesburg recently under the chairmanship of Professor M. C. Botha. It is unlikely that there will be any drastic changes for some time. The most important immediate task of the board is the tactful and just carrying out of the "fifty-fifty" policy in the use of English and Afrikaans. —*The Times.*

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—August 24th. U.D.C. Motors and control gear for the change-over from d.c. to a.c. (July 31st.)

Arbroath (ANGUS).—August 17th. Town Council. Electrical and heating work at Public Assistance Home, Little Cairnie. Borough engineer (deposit £1).

Australia.—SYDNEY.—November 2nd. County Council Electricity Undertaking. Two 50,000-kW steam turbo-alternators and auxiliary equipment at the Bunnerong power station. (T. 30523.)*

September 9th. Department of Railways (Electrical Branch). One 3,125-kVA, 50-cycle alternator and spares for the Lithgow power station. (T. 30565.)*

Banff.—Town Council. Electric street lighting equipment. Borough surveyor, Low Street.

Barking.—August 18th. Electricity Department. Four 400-kVA transformers. (See this issue.)

Bedford.—August 27th. Corporation. Permanent fire protection installations, with automatic and manual control, in the generating station and certain sub-stations. Borough electrical engineer, Electricity Offices, Prebend Street (deposit £1 1s.).

Bexhill-on-Sea.—August 15th. Borough Council. Electrically driven centrifugal bore-hole pump. Water engineer, Town Hall.

Coventry.—August 8th. Electricity Committee. Two brick-built chimneys at the Longford generating station. (July 24th.)

Dundee.—August 17th. Harbour Trust. Electrical work at Harbour Chambers. Maclaren, Soutar & Salmond, architects, 15, S. Tay Street.

Eastbourne.—August 18th. Electricity Committee. Coal for six months from October 1st next. (See this issue.)

East Retford.—Corporation. Two kiosks and transformers and e.h.v. and l.v. cables. (July 31st.)

Edinburgh.—September 18th. Borough Council. One 30,000-kW turbo-alternator set with condensing plant and auxiliaries, for the Portobello generating station. (July 24th.)

Egypt.—CAIRO.—September 28th. Mechanical and Electrical Department, Ministry of Public Works. Air-conditioning plant for the new Chemical Department Building. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, London, S.W.1. (deposit £1 10s. 9d. not returnable).

Fife.—August 10th. County Council. Electric lighting in thirty-six houses at North Queensferry. C. R. Douglas & Son, surveyors, Dunfermline (deposit £1 1s.).

August 17th. Electric lighting, &c., at houses at Limekilns. C. R. Douglas & Son, purveyors, 15, East Port, Dunfermline (deposit £1 1s.).

Finchley.—August 17th. Electricity Department. Metal-clad, air-insulated, l.v. switchgear (See this issue.)

Folkestone.—September 14th. Corporation. Internal and external wiring of 453 houses and flats on the Canterbury Road housing estate. (See this issue.)

Frome.—August 31st. U.D.C. Two sets of electrically driven centrifugal surface pumps in duplicate, for the new well at Egford. Parker, Pearson and Ross Hooper, engineers, Dallas Chambers, Chippenham, Wilts (deposit £1).

Glasgow.—August 12th. Education Department. Electrical work at St. Mark's No. 2 temporary school extension and electrical goods lift at Buchan Street stores. Education Offices (Property Department), 129, Bath Street (deposit £1 1s. each).

August 13th. Corporation. Electrical installations at thirty houses on the Haghill Road housing estate. Town Clerk's Office, Room 36.

Hazel Grove and Bramhall.—August 11th. U.D.C. Electricity Department. One 150-kVA, one 200-kVA and one 500-kVA transformers with externally operated off-load tap-changing gear. (July 31st.)

Hebden Bridge.—August 11th. U.D.C. Electricity Department. One 300-kVA, 6,600/400/230-V, three-phase transformer. (See this issue.)

India.—SIMLA.—August 11th. Stores Department. Train lighting dynamos with motoring resistances and terminals; magnetic battery change-over switches and main magnetic switches. (T.Y. 30531.)*

August 27th. Inert cells, dry cells and sac elements for Leclanché type cells with and without ventilating tubes, as required during twelve months from December 1st, next. (T. 30539.)*

August 15th. Drilling, boring, tapping and studding machines, with motors and full electrical equipment and spares. (T. 30541.)*

August 29th. Train lighting equipment, dynamos, cut-in and out switches, lamp resistances and fuse boxes. (T.Y. 30612.)*

September 1st. Seventy-five three-pole, automatic time switches. (T.Y. 30611.)*

August 25th. Insulating materials during twelve months from December 1st next. (T.Y. 30592.)*

Irvine (AYRSHIRE).—August 12th. Town Council. Electric lighting at 156 houses. Town clerk (deposit £1 1s.).

Manchester.—August 25th. Electricity Committee. One motor-driven boiler feed pump for the Stuart Street power station. (July 31st.)

Newton-in-Makerfield.—August 15th. U.D.C. Electricity Department. Two 2,500-kVA transformers. (July 31st.)

New Zealand.—WELLINGTON.—September 29th. Public Works Department. Twenty-five 110-kV single-phase potential transformers. (T.Y. 30510.)*

October 27th. Four 1,000-kVA single-phase transformers. (T.Y. 30512.)* Four 1,667-kVA single-phase transformers. (T.Y. 30511.)*

November 10th. One 5,000-kVA, 11-kV synchronous condenser. (T.Y. 30584.)*

October 27th. 33-kV/11-kV transformer bank. (T.Y. 30574.)*

November 3rd. Motor operated weir penstock gate and equipment for water rheostat. (T.Y. 30576.)* 22,200-kVA generator and turbine. (T.Y. 30573.)*

Northampton.—August 25th. R.D.C. Electrically driven centrifugal pumping plant, &c. R. J. Miller, 1, Spencer Parade.

Northern Ireland.—BELFAST.—August 10th. Electricity Committee. One 5,700-kVA, three-phase, neutral earthing compensator with limiting resistance for 6,600-V, three-phase system. (July 31st.)

Paisley.—September 4th. Corporation. Electric lighting, &c., at 782 houses on the Ferguslie Park estate. Master of Works Office, 16, Gilmour Street.

Plymouth.—August 29th. Corporation. L.v. distribution boards. City electrical engineer.

Poole.—August 20th. Town Council. Electrically driven centrifugal unchokeable type pumps, with motors, in duplicate. E. J. Goodacre, borough engineer (deposit £1 1s.).

St. Helens.—August 24th. Electricity Department. Three sets of rectifying equipment. (See this issue.)

Sheffield.—August 10th. Electricity Committee. Works auxiliary 11-kV, three-phase, 150-mVA switchgear for the Neepsend generating station. (July 24th.)

South Africa.—JOHANNESBURG.—September 17th. City Council. Two 1,500-kVA and two 1,000-kVA transformers, two circuit-breaker units and link and fuse boxes, with accessories. (T.Y. 30551.)*

August 15th. Fifteen sets of automatic point operated gear for use on 550-V d.c. (T.Y. 30527.)*

August 24th. Railways and Harbours Administration. Electric lamps required during twelve months from January 1st, 1937. (T. 30558.)*

September 28th. Two electric battery tractors. (T.Y. 30605.)*

CAPE PROVINCE.—September 14th. Beaufort West Municipality. Plant and equipment in connection with the commission of the local system of electrical generation and distribution, and the erection of a new power station. (T.Y. 30567.)*

Southend-on-Sea.—August 11th. Electricity Department. Electrical installation work at the Municipal Hospital, Rochford, and at fifty-six houses on the Southview estate, Eastwood. (July 24th.)

Stirling.—County Council. Electrical work in 242 houses at Stenhousemuir, Larbert. J. A. W. Grant, architect, 25, Rutland Square, Edinburgh, 1.

Sunderland.—August 31st. Corporation. P.i. cable, r.i. wire, consumers' meters and electric lamps for twelve months ending October 31st, 1937. (See this issue.)

Uruguay.—MONTEVIDEO.—August 20th. State Electricity Supply and Telephones Administration. 850 1,000-W lamps. (T.Y. 30538.)*

September 3rd. Sixty-eight three-phase meters for private lighting and power installations. (T.Y. 30549.)*

Whitburn (WEST LOTHIAN).—Town Council. Various works, including electric lighting and power, at 134 houses. Town Clerk, Bloomfield House, Bathgate.

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*Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Recommended. Oil purification plant (£150).—Hopkinsons, Ltd. Battery repairs (£84).—Chloride Electrical Storage Co. Meter testing equipment (£341).—Met.-Vick. Electl. Co. Discharge lamps.—B.T.H. (£334); G.E.C. (£309).

Barnstaple.—Town Council. Accepted. Diesel plant for the electricity works (£16,157).—Bellis & Morcom, Ltd.

Bexhill-on-Sea.—Town Council. Accepted. Conversion of wireless apparatus in connection with the change-over (£1,399).—Radiomenders, Ltd.

Exeter.—Electricity Committee. Accepted. Eighteen transformers (£1,868).—Yorkshire Electric Transformer Co.

Hull.—Transport Committee. Accepted. Trolley buses: Twenty-five Leyland "TD4" chassis with Met.-Vick. augmented field control (£955 each), and one Leyland "TD4" chassis with Met.-Vick. regenerative control (£989).—Leyland Motors, Ltd. Twenty-six 56-seater bodies (£955 each).—Metropolitan-Cammell-Weymann, Ltd.

Education Committee. Accepted. Rewiring at Thoresby Street school (£800).—Booker & Tarran.

Electricity Committee. Accepted. One 30,000-kW turbo-alternator and condensing plant (£100,370).—C. A. Parsons & Co. Two 150,000-lb. per hour boilers and civil engineering work (£157,880).—Clarke, Chapman & Co. 22,000-V switchgear (£20,970) and 400-V and 6,600-V switchgear (£3,534).—A. Reyrolle & Co. Two 15,000kVA static transformers and one 20,000-kVA reactor (£13,350).—Met.-Vick. Electl. Co. Pumps for High Flags outfall (£3,137).—Mather & Platt, Ltd.

Manchester.—Education Committee. Accepted. Electrical installation at Styal Domestic Centre.—W. A. Shaw & Co., Stockport. Electric irons at Moseley Road school.—S. H. Heywood & Co.; at Cavendish school.—A. Loudon. Electrical repairs at Grange Street school.—A. E. Sudlow & Co.

Electricity Committee. Accepted. Electric passenger and goods lift at the Barton power station.—E. A. Foulds, Ltd. Motor.—Lancashire Dynamo and Crypto, Ltd. Switchgear.—Dewhurst & Partner. 33,000-V cable at Barton station.—Standard Telephones. 200-kW rectifier equipment at the Bradford Road gas works.—Electric Construction Co.

Housing Committee. Accepted. Electrical installations in Collyhurst flats.—D. Foote, Droylsden.

Transport Committee. Accepted. Cadmium copper trolley wire.—Pirelli-General Cable Works, Ltd.

Water Committee.—Accepted. Control gear.—Watford Electric & Mfg. Co. Cabling.—W. J. Furse & Co. (Manchester), Ltd.

Lichfield.—Electricity Committee. Recommended. Switchgear (£647).—Harland Engineering Co. Overhead line extension at Sandhills.—Standard Telephones. Switchboard extension (£273).—Ferguson, Pailin.

Middlesex.—County Council. Electrical installations at the County Hospital, Hillington:

	£		£
Page & Girling, Ltd. Accepted	4,201	F. H. Wheeler & Co.	4,547
Read & Partners, Ltd.	4,314	Electrical Installations, Ltd.	5,289
Collins Electrical, Ltd.	4,351	B. French, Ltd.	5,326
Constable, Hart & Co.	4,392	G. A. Weston	5,481
Dicks, Ltd.	4,429	E. Wight & Co.	5,503
T. Clarke & Co.	4,544	Caine Pernot, Ltd.	6,500

Electrical installations at Chase Farm schools, Edmonton:

	£		£
E. Wight & Co.	6,795	B. French, Ltd.	7,667
Colston Electrical Co. Accepted	6,985	Bective Electrical Co.	7,704
G. E. Wallis & Sons	7,308	Constable, Hart & Co.	7,990
S. Reed & Sons	7,516	C. F. Williams	8,651
H. J. Cash & Co.	7,645		

Goods lift at the North Middlesex County Hospital:

	£		£
Lift & Hoist Co. Accepted	125	Waygood-Otis, Ltd.	159
Hammond Bros. & Champness, Ltd.	135	Gimson & Co.	169
Etchells Congdon & Muir, Ltd.	154	Express Lift Co.	171

Mirfield.—U.D.C. Accepted. Electrical work at sixty-three houses (£466).—Herbert Senior.

Newark.—Town Council. Accepted. Completion of the l.v. feed in Stodham Street and Castlegate (£69) and a kiosk in Stanley Street (£285).—W. Lucy & Co.

Northumberland.—County Council. Accepted. Electrical installation at the new Mental Hospital, Morpeth.—H. Walker & Co.

Oldbury.—Education Committee. Recommended. Electric lighting installations at Rounds Green and Rood End schools (£407).—S. Davis, West Bromwich.

Housing Committee. Recommended. Electric lighting at houses on the Holt Farm estate (£185).—Electromobile Engineering Co.

Saltcoats (AYRSHIRE).—Town Council. Accepted. Electrical installations in seventy-two houses in Old Rouse Road.—G. Watson.

Sheffield.—Electricity Committee. Distribution transformers for sub-stations (£4,907).—Electric Construction Co.

South Shields.—Town Council. Accepted. Electrical fittings. J. Taylor; Dunford & Co.; B.I. Cables; British Elecl. and Mfg. Co.; B.T.H.; Andrews and Co.; E.G.S. Co.; Newcastle General Supplies Co.; Siemens Electric Lamps and Supplies; J. Gledson and Co.; J. L. Miller and Co.; G.E.C.

Stirling.—County Council. Accepted. Electric lighting at seventy-two houses at Seabegs, Bonnybridge.—T. Laurie and Co., Falkirk.

Tynemouth.—Town Council. Accepted. Transformer (in lieu of previous tender).—C. A. Parsons & Co. Electrical installations in twenty-six houses on the Ridges estate.—J. E. Robinson, North Shields.

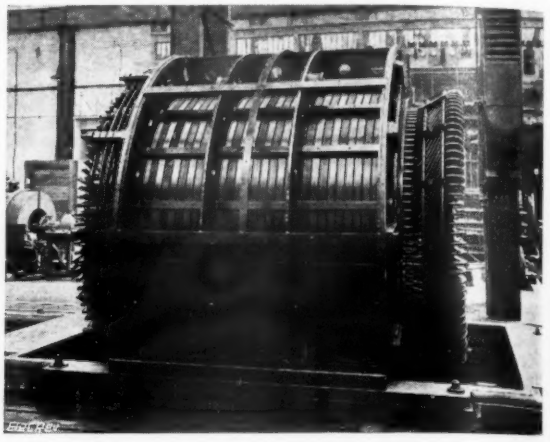
Notes

A Bognor Invitation

Mr. D. K. Grieve, sales manager to the Bognor Gas and Electricity Co., writing from the company's showrooms in Argyle Road, Bognor Regis, extends to all electrical visitors to Bognor an invitation to call at the company's Electrogas Athletic and Social Club, 1, West Street, of which he is general secretary.

A Large Rotary Condenser

The necessity for regulating the voltage on the new 220-kV power line from the Rhine to Paris (which was described in our July 17th issue) has led to the installation of a large synchronous compensator at the Creney sub-station, which is the junction of a group of five high-voltage transmission lines. The set comprises a compensator, a main exciter, an auxiliary exciter and a synchronised asynchronous starting motor, all on the same shaft. The set has a capacity of 20,000 kVA reactive at 12,900 V, or of 10,000 kVA reactive at 10,050 V. The power can be raised from 0 to 40,000 kVA reactive in two seconds by voltage control. The stator is built of welded sheet to which the sheet cores of the armature are fixed by trapezoidal wedges. These are separated into twenty-seven parts by ventilation ducts. The windings are composed of 12-strand cable, and would so as to leave space for the fixing of twelve thermocouples for measuring temperature. The rotor is built up on a forged steel shaft, which has milled slots into which the poles are fixed. These are composed of sheet iron on which the copper strap windings are arranged, insulated by asbestos and micanite. The main exciter is at the end of the shaft, and is built for 60 kW at 100 V, but it can be raised to 250 V for 30 seconds. The pilot exciter is a 4-pole compound type with a normal voltage of 240 V, developing 3.6 kW. This feeds the normal inductor of the main exciter by means of a potentiometric rheostat. The main exciter can also be fed from a set of storage batteries in case of breakdown of the pilot. A second connection is to the



The stator of the 20,000-kVA condenser

heavy wire inductor of the main exciter through a contactor, which is normally open but which closes whenever the voltage of the 220-kV lines drops by over 10 per cent. The regulator and associated relays are fed by current which is the direct component of the three phases, furnished by three transformers, each from a phase to ground, whose secondary outputs go through filters to the relays.

Technical Bulletins

An "Occasional Paper" (No. 10) has been prepared by Marconi's Wireless Telegraph Co., Ltd., dealing with serial terminal calculations. There are twenty pages of typescript.

"Transformers" is the title of a booklet based on a paper read before the Scottish I.E.E. and published by the Foster Engineering Co., Ltd. The forty-eight pages contain sixteen illustrations and diagrams.

I.E.E. Transmission Section Golf Competition

This year's golf competition arranged by the I.E.E. Transmission Section Committee will take place on Friday afternoon, August 28th, and will again be played at Sundridge Park Golf Club, near Bromley. Members of the Section wishing to enter should send in their names to the secretary of the Institution not later than August 17th.

E.A.W. Electrical Housecraft Examinations

Out of the eighty-two candidates who entered for the Electrical Association for Women's examination for demonstrators and saleswomen held on June 18th, sixty-five were successful, two with distinction; this brings the total number now holding the certificate to 355. In the examination for teachers on June 25th, sixty-nine out of eighty-nine gained certificates (four with distinction), making 253 certificate-holders.

Appointments Vacant

Showroom attendant and clerical assistant for Skipton Electricity Department.

Lady demonstrator for Walsall Electricity Department.

Junior draughtsman at Chester for the War Department.

Electrical engineering assistants in the drawing office for the Air Ministry.

Assistant mechanical and electrical engineers for the Air Ministry.

Sales service engineer for the Wallasey Electricity Department.

Laboratory assistants at Bawdsey Research Station for the Directorate of Research, Air Ministry.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

VAN DORN hand drill.

Apparatus for washing e.h.v. insulators whilst overhead lines are still alive.

AKRONETA iron heater.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. E. J. Jarvis, whose appointment as borough electrical engineer at Kingston-on-Thames was briefly recorded in our last issue, served his general engineering apprenticeship at Plymouth and to electrical engineering with the Chesterfield Corporation. He subsequently held appointments with the Torquay Corporation and the Devonport (now Plymouth) Corporation. During the war he held a commission in the Royal Engineers, and on returning to civil life joined the North Metropolitan Electric Power Supply Co. Later he was appointed engineer and manager of the Ilkley U.D.C. electricity undertaking, and for the past eight years has been electrical engineer and manager of the Scarborough Electricity Department. During his eight years in Scarborough, the general supply has been changed from single-phase 80-cycle d.c. to 3-phase 50-cycle a.c., and what may be termed a complete new generating station has been installed, including a new mains system and sub-stations. When Mr. Jarvis first took up his appointment at Scarborough the kWh sold totalled three millions; during the last financial year the total was 12¼ million kWh, the annual revenue during the eight years having risen from £53,000 to over £134,000, and the number of consumers from 3,000 to 12,674, the load factor rising from 28.4 per cent. to 36 per cent.

Mr. E. J. Jarvis

Mr. J. M. Crawford has retired from the position of chief engineer of the Commonwealth of Australia Postmaster-General's Department, states the *Electrical Engineer and Merchandiser*. Mr. Crawford is a native of Liverpool, in which city he received his education and first engineering experience. He joined the engineering branch of the British Post Office in 1896, and in 1901 was transferred to London on telephone work. He was engineer of communications at the coronation of King Edward VII. In 1912 he was appointed assistant engineer-in-chief of the Commonwealth Postmaster-General's Department, and he served subsequently as State engineer for Victoria and later as State engineer for New South Wales. He was appointed chief electrical engineer in 1924.

Mr. Charles J. Turner, A.M.I.E.E., who, after thirty years' service as chief engineer and manager to the Hoylake and West Kirby Urban District Council, has tendered his resignation owing to ill-health, received his technical education at the Sheffield University and Technical College. After four years' apprenticeship in the Sheffield Corporation Electricity Department he held, consecutively, positions as mains assistant and meter superintendent to the South Shields Electricity Department and draughtsman and mains engineer to the Islington Electricity Department. Joining the Hoylake Electricity Department about thirty-six years ago, he was soon appointed chief assistant engineer and, three years later, chief engineer. During the war he served as electrical officer lieutenant, R.N.A.S., and captain, R.A.F., in charge of all electric power and lighting plant at Felixstowe and seven other naval air stations. Mr. Turner is now fifty-eight years of age.

Mr. Charles J. Turner

The marriage took place on July 29th, at St. James's Church, Spanish Place, W.1, between **Mr. C. A. Settle,** barrister-at-law, son of Dr. T. Settle, of the General Electric Co., Ltd., and Miss Pamela Marcy.

Mr. W. G. Watson, managing director of Messrs. W. G. Watson & Co., Ltd., electrical engineers, Sydney and Melbourne, has been appointed managing director of the Enfield Cable Works (Australia), Ltd., in succession to Mr. A. E. Flaskett, who since 1935 has been living in England. **Mr. H. J. Perry,** who has been acting as manager since 1935, has been appointed a director.

Mr. E. Parkes, a member of the staff of the Nottingham Corporation Electricity Department, was married at Loughborough on July 25th to Miss Mary Lillian Story.

Mr. Frank H. Farthing, whose portrait accompanies these notes, is manager of the showrooms of the General Electric Co., Ltd., in Kingsway, London, W.C.2, the reconstruction and decoration of which were referred to in a recent issue of the ELECTRICAL REVIEW. He joined the company nineteen years ago.

Mr. F. H. Farthing

The Council of the City and Guilds of London Institute has conferred the distinction of Fellow of the Institute (F.C.G.I.) upon the following: Messrs. A. D. Constable, O.B.E., M.I.E.E.; B. Hague, D.Sc., M.I.E.E.; A. C. Hartley, B.Sc. (Eng.), M.Inst.C.E., M.I.Mech.E.; J. Hollingworth, M.A., D.Sc., M.I.E.E.; and E. G. Walker, B.Sc. (Eng.), M.Inst.C.E., M.I.Mech.E.

Mr. W. T. Dean has been appointed managing director of Holophane, Ltd., to succeed **Mr. Hepworth Thompson,** who has retired. **Dr. S. English,** D.Sc., F.I.C., F.Inst.P., has been elected to the board as a director. He is vice-president of the Illuminating Engineering Society.

Mr. A. Blake, electrical engineer to the Fareham Urban District Council, is retiring at the end of September, having been in charge of the undertaking since the Council acquired it in 1890. The Council has placed on record its appreciation of his services.

Mr. C. W. Horner, deputy electrical engineer at Fareham, has been recommended by the Lighting Committee of the Urban District Council for the appointment of electrical engineer, and **Mr. L. A. Smith** is recommended for the position of deputy electrical engineer.

Mr. H. F. Hunt, A.M.I.E.E., superintending electrical engineer at Portsmouth Dockyard, who has retired after thirty-three years' service, has been presented by his colleagues with a grandfather chiming clock, a radio set and an autographed photograph of the staff, together with a tea salver for his wife. He is succeeded by **Mr. W. H. Chatten,** A.M.I.E.E., of Sheerness, who recently returned from Hong Kong.

Mr. G. T. Champion, who contributes the article on "Electricity from Exhaust Steam" (page 175), has had some years of experience in this class of work as engineer and manager of Messrs. Veritys, Ltd., for the West of England area. He has been in the employ of the company for over twenty-five years, and previously was with such concerns as Messrs. W. Sisson, Gloucester, Messrs. Bellis & Morcom, and the North-Eastern Marine Engine Works.

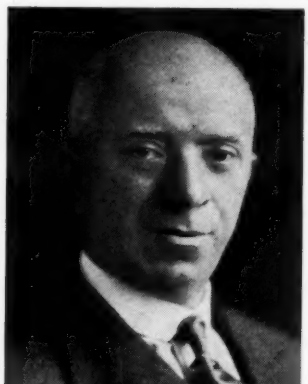
Mr. G. T. Champion

Mr. T. H. Kelsey, a member of the Liverpool staff of the General Electric Co., Ltd., was recently married at St. Wilfred's Church, Northenden, Manchester, to Miss Olive Staley, private secretary to Mr. J. H. Farthing, a director of the company.

We are glad to hear from **Mr. C. A. Frost,** the Bexhill-on-Sea borough electrical engineer, who has been contemplating retirement owing to ill health, that he is very much better and that he has acceded to a request of the Council (in view of the effect of the MacGowan Report on the undertaking) to continue in office for at least another year.

Major Richard Amberton, M.I.E.E., of Messrs. Amberton & Partners, has joined the board of Messrs. Dorman & Smith, Ltd., Manchester.

Mr. Walter C. Eve, commercial manager to Standard Telephones & Cables, Ltd., recently completed thirty years' service with the company, and the occasion was marked by a pleasant function at which he was entertained by his friends and colleagues. He was presented with a thirty-years' service badge and a model golf course made in the shops at New Southgate. Mr. T. G. Spencer made the presentation of the badge; Mr. H. C. Trenam, managing director of the Australian Co., referred to the excellent service rendered by Mr. Eve when he held the reins of the Sales Department; and Mr. N. V. Kipping unveiled and presented the golf course. Although actively engaged in matters concerning telephony, Mr. Eve did not start life in the electrical profession. He was born in 1886, and, after leaving London University, commenced his career in the architectural profession, but before long he entered the electrical industry. He began his electrical work with the Western Electric Company, and by various stages, *via* the estimating, sales, and publicity departments, and thence from being publicity manager and sales manager, he reached his present position. During his thirty years he has gained great experience of various associations connected with the industry. He is an original member of the Council of the National Association of Radio Manufacturers, was chairman of the Incorporated Society of British Advertisers (otherwise I.S.B.A.), and he is a member of the British Radio Valve Manufacturers' Association. He is well known throughout the telephone industry, and his hobbies, apart from business, are gardening and golf.



Mr. W. C. Eve

Obituary

Mr. J. A. Robertson.—We regret to announce the death on July 29th of Mr. James Archibald Robertson, M.I.E.E., M.I.Mech.E., consulting engineer of Manchester, at his home at Buxton. His early education was received at the Glasgow and West of Scotland Technical College and his training with the Liverpool Electric Supply Co., Messrs. Mavor & Coulson, Ltd., and in Lord Kelvin's Laboratory, Glasgow. From 1900 until 1902 he was chief electrical engineer to Denny Bros., shipbuilders, Dumbarton. In the latter year he was appointed burgh electrical engineer of Greenock, and remained in this position until 1914, when he left to take up a similar post with the Salford Corporation. From 1922 onwards he practised as a consulting engineer and acted for a number of municipal and company undertakings, including those of Salford, Preston and Stretford. He was chairman of the Scottish Centre of the Institution of Electrical Engineers in 1913 and of the North-Western Centre in 1919. He was also president of the Manchester Association of Engineers in 1929. Mr. Robertson contributed several papers to various technical and engineering societies.

The late Mr. J. A. Robertson

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Baker, Duthie & Co., Ltd.—Private company. Registered in Edinburgh July 27th. Capital, £4,000. Objects: To carry on the business of manufacturers and repairers of and dealers in and contractors for the installation of lighting and heating appliances, lamps, lampshades, radio receiving and television apparatus, &c. The directors are: J. A. Baker, 195, Archerhill Road, Knightswood, Glasgow, and two others. Registered office: 146, St. Vincent Street, Glasgow, C.2.

W. D. K. Phillips & Co., Ltd.—Private company. Registered July 30th. Capital, £5,000. Objects: To acquire the business of a radio, electrical and television engineer and dealer in electrical apparatus, gramophones and television apparatus carried on by W. D. K. Phillips at 143, Sidwell Street and 1, Milk Street, both in Exeter. The first directors are: W. D. K. Phillips, 143, Sidwell Street, Exeter; and J. Douglas, Woodstock, Kingswood, Bristol. Solicitor: Fredk. P. Cottey, 25-6, Gandy Street, Exeter.

R. A. D., Ltd.—Private company. Registered July 30th. Capital, £7,000. Objects: To carry on the business of manufacturers, designers and constructors of internal combustion and other engines of all kinds, automobile, aeronautical, mechanical, electrical, consulting and general engineers, &c. The subscribers are: C. H. Polley, 69, Vicarage Road, Chelmsford, Essex; and K. L. Titmuss, 52, Cunningham Park, Harrow. Solicitors: A. Blackman, Hailey & Co., Capel House, E.C.2.

Amplaudio, Ltd.—Private company. Registered July 27th. Capital £10,000. Objects: To acquire the business of manufacturers of sound amplification apparatus carried on by the Direct Communication Co., Ltd. The permanent directors are: B. B. Braunston, A. J. Webb, N. F. Blake and A. E. C. Snell, addresses not stated. Solicitors: J. H. John and Co., 40, Russell Sq., W.C.1.

A. & P. Capel, Ltd.—Private company. Registered July 28th. Capital £6,000. Objects: To carry on the business of importers and exporters of and dealers in wireless goods and accessories, etc. The subscribers are: A. Capel, "Thel Ray," The Retreat, Penylan, Cardiff, radio dealer; and P. Capel, 64, Plasturton Avenue, Cardiff, company director. Secretary: M. Roberts. Registered office: 94, Queen Street, Cardiff.

C. H. Wood & Co., Ltd.—Private company. Registered July 27th. Capital, £1,000. Objects: To carry on the business of electrical, wireless and mechanical engineers, contractors and merchants, dealers in electrical fittings, etc. The directors are: J. H. Bainbridge, 14, Hawthorn Rd., Hollinwood, Oldham, musical instrument dealer (governing director and chairman); and two others. Solicitors: C. J. Booth and Middleton, 366, Manchester Rd., Hollinwood, Oldham.

Returns of Electrical Companies

South Metropolitan Electric Light & Power Co., Ltd.—Particulars have been filed of debenture stock to secure £1,000,000 (inclusive of £500,000 already registered), authorised by resolutions of May 29th, 1931, and July 14th, 1936, and covered by trust deed dated July 17th, 1936 (supplemental to trust deed dated July 1st, 1931). Property charged: The company's undertaking and property, present and future, including uncalled capital. The amount of the present issue is £500,000. Trustees: F. C. Tiarks and G. V. Tate.

Electric Supply Corporation, Ltd.—Capital, £750,000 in 431,282 and 250,000 preference and 68,738 unissued shares, all of £1. Return dated May 7th, 1936. All preference and ordinary shares taken up. £529,000 paid on 279,000 ordinary and 250,000 preference shares. £152,262 considered as paid on 152,262 ordinary shares. Mortgages and charges, nil.

Union Cable Co., Ltd.—Capital, £100,000 in £1 shares. Return dated May 28th, 1936. All shares taken up. £75,000 paid (£1 on 50,000 and 10s. on 50,000). Mortgages and charges, nil.

Wellingborough Electric Supply Co., Ltd.—Capital, £50,000 in £10 shares. Return dated May 5th, 1936. All shares taken up. £50,000 paid. Mortgages and charges, £45,000.

Cox-Walkers Electric, Ltd.—Charge on lands, factories, &c., at Darlington, dated July 8th, 1936, to secure £2,500. Holder: R. Potts, "Rathmines," Marldon Road, Paignton, Devon.

Atkins Electrical Appliances, Ltd.—Particulars filed of debentures not exceeding £1,500 authorised July 21st, 1936, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,500.

A. L. Turner, Ltd.—Issue on October 8th, 1934, of £100 debentures, part of a series already registered. (Notice filed July 23rd, 1936.)

S. O. Bowker.—Capital £1,000 in £1 shares. Return dated December 31st, 1935 (filed May 20th, 1936). 850 shares taken up. £850 paid. Mortgages and charges, nil.

A. Dean & Co. (Norbury), Ltd.—Capital, £1,000 in £1 shares. Return dated December 9th, 1935 (filed May 5th, 1936). All shares taken up. £1,000 paid. Mortgages and charges, nil.

I. Calvete, Ltd.—Satisfaction in full on July 15th, 1936, of charge in favour of Midland Bank, Ltd., dated November 9th, 1934, and registered November 10th, 1934. (According to the register of mortgages, the charge registered November 10th, 1934, originally secured all moneys due to bank.)

Moores (Electricians), Ltd.—Debenture dated July 14th to secure £206 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Reynard & Sons, Ltd., 31, Scotland Road, Nelson.

British Electric Resistance Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated July 20th, 1936, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Aylesbury Battery & Electrical Co., Ltd.—Particulars filed of £1,000 debentures, authorised July 17th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued, and ranking *pari passu* with debentures issued April 27th, 1936.

City Notes

The Jerusalem Electric & Public Service Corporation, Ltd.—In spite of the somewhat abnormal conditions prevailing in Palestine during recent months there have been no serious incidents affecting the company's property, though the position has naturally affected the revenue. This statement was made by Mr. William Shearer, chairman, at the annual general meeting held on Wednesday last week. He added that the inevitable decrease in consumption of electricity had been partially offset by an increase in the use of electricity for street lighting and other purposes. It was still difficult to assess what the full effect of the disturbances would be but he did not anticipate any serious setback. The accounts showed steady and satisfactory progress, the number of consumers at March 31st last, at 11,040, being 2,797 above the figure for the previous year; the total to date was 11,800. To meet this expansion extensions of both plant and mains had been necessary and a new 2,000-kW unit was now about to be shipped to Palestine so as to be available for next winter's load. During the year extensions had been made to several new districts including Et-Tur, New Bukharia and the broadcasting station near Ramalah. The total mileage of cables and transmission lines was ninety-four, and twenty-two sub-stations and kiosks had been provided. Further reductions in tariffs would be put into effect as soon as conditions permitted.

Turner & Newall, Ltd., are offering to ordinary stockholders the opportunity of subscribing a small proportion of additional capital on advantageous terms. Ordinary stockholders will be entitled to apply for, and to receive, one new ordinary share of £1 fully paid in respect of each complete £10 of ordinary stock held. The purchase price is 70s. per share, and the shares will rank *pari passu* with the existing ordinary stock for all dividends in respect of the financial year beginning October 1st next. In a circular announcing the offer the directors state that the ever-widening opportunities of the asbestos and allied industries render it desirable for the company to undertake, within the near future, certain important new developments which will involve capital expenditure of not less than £1,500,000.

The Adelaide Electric Supply Co., Ltd., informs share and debenture holders on the London register that with regard to the assessments for Australian absentee taxation which have been made in respect of debenture interest, it is now understood that these will not be proceeded with and that such interest will in future be entirely free from Australian taxation. With regard to assessments in respect of preference and ordinary dividends, it is stated that the directors of the company in Adelaide have for some time past been in communication with the Commonwealth Taxation Department and that shareholders will be further advised as soon as definite information is available. Meanwhile it has already been decided to grant substantial exemptions and allowances before such dividends will become liable to taxation in future.

Worthington-Simpson, Ltd.—With a view to the control of the company being brought back from the United States to this country it is proposed to alter the capital structure, and it is reported that the Worthington Pump & Machinery Corporation, Virginia (the controlling company), has agreed to accept two 10s. ordinary shares for each 6 per cent. cumulative preference £1 share held. The authorised capital is now £400,000 (issued £398,768 in 400,000 10s. ordinary and 198,768 (part of 200,000) six per cent. cumulative preference £1 shares). Of these all the ordinary and 124,758 of the preference shares are at present owned by the controlling company. It is expected that over half of the ordinary shares will be marketed in the near future.

Ultra Electric (Holdings), Ltd.—The first annual meeting was held on July 31st, when Mr. E. E. Rosen (chairman), who presided, said that the manufacturing company had experienced considerable disruption and disturbance of its manufacturing processes, occasioned by its removal to the new factory. These difficulties had now been surmounted, and the factory was running at a high standard of efficiency. The trading figures of the manufacturing company for the three months which had elapsed since April showed a satisfactory increase over the same period of last year. With regard to television, when the time came for commercialisation of that feature the company would be ready.

The Buell Combustion Co., Ltd.—After taking into account profit on the sale of securities and income tax recoverable there was a net loss of £15,195 for 1935 against a loss of £16,205 in the previous year, the debit brought in being increased to £55,184. Sales showed an increase over 1934. Until several new processes, still in process of development, are more firmly established, however, expenditure incurred thereby must exceed initial revenue.

Edmundsons Electricity Corporation, Ltd.—On behalf of themselves and their associates, Messrs. Lazard Bros. & Co., Ltd., have bought the holdings of Utilities Power & Light Corporation in the company. This acquisition carries with it the ownership of all the issued ordinary shares in the company not already held by the British public amounting to approximately £2,700,000.

Barton & Sons (1935), Ltd., have declared their first interim dividend, one of 3 per cent., on their ordinary shares. The trading period is to be extended until October 31st next so that the accounts may reflect more of the results of certain developments which have taken place since the company was formed in June, 1935.

Associated Electrical Industries, Ltd., is raising its capital to £6,495,000 by the creation of 100,000 eight per cent. cumulative preference shares of £1, ranking *pari passu* with the existing eight per cent. preference shares. The object of the capital increase will, it is understood, be announced at a meeting to be held on August 11th.

Standard Switchgear, Ltd.—At an extraordinary general meeting held on July 29th it was decided to increase the capital of the company to £10,000. Further extensions to buildings and plant are contemplated.

Increases of Capital.—The capital of the following companies has been increased to the extent shown: Max Stone, Ltd., from £140,000 to £210,000; Woking Electric Supply Co., Ltd., from £225,000 to £300,000.

The Dublin United Tramways Co. is paying an interim dividend of 2 per cent. on the ordinary stock. No dividend was paid in respect of the year 1935 on the £660,000 of ordinary stock.

The Yorkshire Electric Power Co., in its half-yearly report, states that the amount of electricity sold again shows a substantial increase and contracts have been made for further supplies. The interim dividend is maintained at 3 per cent.

Electrical Distribution of Yorkshire, Ltd., in announcing an interim dividend of 4½ per cent. on the ordinary stock, states that the sales of electricity and the number of consumers continue to increase.

Davis & Timmins, Ltd., have announced an interim dividend on the ordinary shares of 5 per cent., less tax (against 2½ per cent.).

The Northampton Electric Light & Power Co., Ltd., has declared interim dividends of 2½ per cent. on the 5 per cent. preference shares and 4 per cent. on the ordinary shares.

The Rushden & District Electric Supply Co., Ltd., announces an interim dividend of 3½ per cent. on its share capital.

Siemens and Halske A.G. & Siemens Schuckertwerke propose to redeem their joint 6½ per cent. 1926 loan, amounting to Rm.25,000,000, at 102 per cent. on November 1st.

W. T. Henley's Telegraph Works Co., Ltd., has declared an interim dividend of 7½ per cent. (same) on its ordinary shares.

The City of Buenos Ayres Tramways Co. (1904), Ltd., is to pay a quarterly dividend of 1¼ per cent. (same).

Stocks and Shares

TUESDAY EVENING.

IT is this season of the year that opportunity is taken here to review briefly the events and the price-changes that have occurred since the beginning of the previous January. The past seven months have been notable chiefly by reason of the marked activity in shares of the manufacturing and equipment companies. So far as those of the electricity supply companies are concerned, the market has been quiet throughout the period. Publication of the McGowan Report introduced a certain hesitation in the minds of shareholders, and led to realisations on a mild scale of certain of the popular shares. There has been, however, plenty of money available this year with investment at something of a loss to find profitable employment for capital. Any set-back in prices was followed by absorption of the shares offered, and, in many cases, by recovery in the capital value.

The principal fluctuations in our lists of prices have been those in Cable and Wireless stocks. These, and somewhat erratic ups-and-downs in American utilities, have given their markets a certain amount of speculative interest. The abundance of money throughout the period—January to July inclusive—has provided a determining factor in keeping steady the prices of gilt-edged and kindred securities.

Gilt-edged Stocks

Continuance of easy monetary conditions, the satisfactory condition of home industries, and the ability of the market to absorb new issues of stocks as easily as it receives political shocks and uncertainties, have kept the prices of gilt-edged securities generally firm. Neither the surprise income-tax item in this year's Budget, nor disturbing news from practically every part of Europe, has produced more than temporary setbacks in Stock Exchange markets. The electricity authorities' stocks are standing at about the same levels as they occupied at the beginning of the year. Stocks of the Central Electricity and London Passenger Transport boards—except for the latter's more speculative "C" stock—show no more than fractional variations. The same applies to the West Midlands and London and Home Counties issues. London Passenger Transport "C" stock is quoted 4 points lower now than at the end of last year. The published traffic figures, and the warning of higher operating expenses, leave no hope that profits sufficient to pay 5½ per cent., the present standard dividend, have been earned.

Cable and Wireless

The year has already been an eventful one, with surprises both pleasant and unpleasant, for holders of Cable and Wireless stocks. Prices have been subjected to violent jerks, both upwards and downwards. Starting the year at 106, the price of the preference stock ran up to about 112 at the time of the report and dividend declaration, both of which were well received. The cold douche of the exposition, at the subsequent meeting, of the company's position and prospects, and the

non-materialisation of any scheme for dealing with preference dividend arrears and the unwieldy capital structure, caused keen disappointment. The preference fell below 100, rallying later upon news of reorganisation of the operating company's management, and of a proposed re-examination of the situation by the Empire Governments. Quotations of Cable and Wireless "A" and "B" ordinary stocks, and, sympathetically, of Globe Telegraph and Trust ordinary shares, have also followed erratic courses. Comparative figures in the Communications group are as follows :—

Stock or Share.	Dec. 31, 1935.	Aug. 4, 1936.	Rise or Fall.
Cable & Wireless Pref.	106	102	— 4
Cable & Wireless "A" Ord.	28½	21	— 7½
Cable & Wireless "B" Ord.	8	6½	— 1½
Globe Ord.	15½	14½	— 1½
Marconi-Marine	36/3	33/9	— 2/6
American Tel. & Tel.	160½	170½	+10
Great Northern	40	45	+ 5

Electricity Supply Shares

The market for electricity supply shares has gone quietly this year. To-day prices are very much the same as they were last January. No decided trend is apparent. With profits in the industry following at a staid pace behind the more vigorous advance of output, stability has become so much the keynote of the market as to justify description of the shares as "gilt-edged" equities. The McGowan Committee's report on the industry produced a ripple of interest, the impression formed of the proposals being that their effect would probably be limited to the acceleration of an already existing tendency for the smaller and less economical suppliers to be absorbed by the large and efficient companies. Some of the variations are as follows :—

Ordinary Shares.	Dec. 31, 1935.	Aug. 4, 1936.	Rise or Fall.
County of London	56/-	54/-	— 2/-
Metropolitans	52/-	51/-	— 1/-
Edmundson's...	44/6	43/6	— 1/-
Electricity Supply Corpn.	62/6	57/-	— 5/6
Elec. Fin. & Securities	68/9	70/-	+ 1/3
Electric Dis. Yorkshire	46/-	47/-	+ 1/-
Mid. Elec. Power	41/3	45/-	+ 3/9
Northampton...	51/3	52/6	+ 1/3
North Met. Elec.	57/6	55/-	— 2/6
Scottish Power	42/6	43/-	+ 6d.

The quotation for London Associated Electricity shares is unaltered on balance. It is interesting to note that no preference is shown by investors for shares in the companies supplying current in the northern areas where the heavy industries flourish.

Manufacturing and Equipment

Proprietors of the leading electrical equipment companies have seen substantial capital appreciation accompany a succession of company reports as good as any to be found in the industrial field of investment. The prices of General Electric and Associated Electrical shares have responded well to progressive trading results and higher distributions to shareholders. The popularity of the cables group has been increased by the manner in which the big companies have maintained and improved their already powerful financial positions. Telephone shares have many new followers as a result of Post Office activity. The following table shows some of the principal price movements :—

Ordinary Shares.	Dec. 31, 1935.	Aug. 4, 1936.	Rise or Fall.
Aron Electricity Meter	55/-	65/-	+10/-
Associated Electrical	43/-	52/-	+ 9/-
General Electric	74/6	84/6	+10/-
British Insulated	5	5 5/8	+11/3
Callender's	3⅞	4 3/8	+11/3
Henley's	7 3/8	7⅞	+11/3
Ericssons	36/3	55/-	+18/9
Electric Construction	32/6	37/6	+ 5/-
Telegraph Construction	25/-	30/-	+ 5/-
Brush	49	39½	— 9½

Crompton Parkinson shares have been the centre of sustained and lively interest. The price has often fluctuated in spectacular fashion. At the end of last year Cromptons stood at 6½, including rights to the 107 per cent. capital bonus. After deduction, a week later, of the equivalent of the latter, the quotation was 3½, as compared with 4⅛ at present.

Miscellaneous Issues

Babcock & Wilcox shares compare none too favourably with many members of the buoyant iron, steel and engineering group. After being depressed rather severely by the dissolution of hopes of a higher dividend payment, the price has now recovered to a level approximately the same as that ruling at the year's opening. The present price—32s. 3d.—of Vickers compare with 27s. 6d. then. A decline of 4s. 9d. is shown by British Aluminium.

British Electric Traction deferred stock stands 50 points lower, but holders have received the customary 10 per cent. stock bonus. The preferred shows appreciation of 2 points. Brazilian Traction are 12, as compared with 10; the gain is partly due to an unexpected cash dividend payment. Transatlantic markets have been subdued, evidence of improving business conditions being partly counterbalanced by Wall Street's lack of enthusiasm for the almost certain return of Mr. Roosevelt in the coming Presidential elections.

Several newcomers have been introduced to the electrical markets. Among the successful were Switchgear and Cowans, Electrical Switchgear, Franco Signs, British Thermostat and Philco Radio.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Aug. 4.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/-	—	4 1 1
Clyde Valley	1	7	8	45/-	—	3 11 1
County of London...	1	10½	10½	54/-	+1/-	3 17 9
Edmundson's 7% Pref.	1	7	7	35/6	—	3 19 0
Do. Ord.	1	8	8	43/6	—	3 13 7
Elec. Dis. Yorkshire	1	9	9	47/-	—1/-	3 16 7
Elec. Fin. and Securities	1	12½	12½	3½	—	3 11 5
Elec. Supply Corporation ...	1	11	11	57/-	—½	3 17 0
Lancs Light and Power	1	7½	7½	38/-	—	3 19 0
Lond. Assoc. Electric	1	—	7	35/-	—	4 0 0
London Electric	1	7	8	39/6	+6d.	4 1 1
London Power Deb. Red. ...	Stock	5	5	108½	—	4 12 2
Metropolitan	1	10	10	51/-	—	3 18 5
Midland Counties	1	7	7½	39/-	—	3 17 0
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	34/-	—	3 10 7
Do. 7% Pref.	1	7	7	35/6	—	3 19 9
Northampton	1	10	10	52/6	—	3 16 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 3
North Met. Elec. Ordinary ...	1	10	10	55/-	+ ⅛	3 12 9
Do. do. 6% Pref. ...	1	6	6	32/6	+6d.	3 13 10
Scottish Power	1	8	8	43/-	—	3 14 5
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	45/-	—	3 11 1
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	118	—	4 4 9
Do. 1955–75 ...	,,	5	5	120	—	4 3 4
Do. 1951–73 ...	,,	4½	4½	111	—	4 1 1
Do. 1963–93 ...	,,	—	3½	104	—	3 7 4
London Elec. Trans. Gtd. ...	,,	—	2½	96	—	2 12 1
London & Home Counties, 1955–75	,,	4½	4½	114	—	3 19 0
London Passenger Transport, A...	,,	—	4½	122½	—	3 13 6
Do. do. B...	,,	—	5	128½	—	3 17 10
Do. do. C...	,,	3½	4	105	—	3 16 2
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	170½	—	5 5 0
Anglo-Am. Tel. Pref.	Stock	6	6	127½	—	4 14 1
Do. Def.	,,	1½	1½	31	—	4 16 9
Cable & Wireless 5½% Pref. ...	,,	4½	5½	102	—1	5 7 10
Do. A. 7½% Ord.	,,	Nil	Nil	21	—	—
Do. B. Ord.	,,	Nil	Nil	6½	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14½	—½	3 3 1
Do. Do. Pref.	10	6	6	14½	—½	4 3 6
Great Northern Tel.	10	20	20	45	—	4 9 0
Marconi-Marine	1	10	7½	33/9	—	4 9 0
Oriental Telephone Ord.	1	12*	12*	3½	—	3 13 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	1450	—	—
Do. do. Pref. Ord.	,,	8	8	175½	—	4 11 2
Brazil Traction	100	—	30 cts.	12	—⅛	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	102½	—	4 17 7
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	51	—2	—
Victoria Falls Ord.	1	20	12	3 11/16	— 1/32	3 1 0
West Riding	1	5	6½	50/-	—	2 12 9
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	65/-	—	4 12 4
Assoc. Elec. Ord.	1	6	8	52/-	+1/-	3 1 6
Do. Pref.	1	8	8	41/-	—	3 18 1
Babcock & Wilcox	1	8	8	52/3	—6d.	3 1 3
British Aluminium Ord.	1	7½	7½	39/-	—	3 17 0
British Insulated Ord.	1	15	20	5 1/8	—	3 12 0
Brush Ord....	Stock	Nil	Nil	39½	—	—
Callender's...	1	15	15	4 7/8	+ 1/8	3 7 7
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/-	—	12½	4½	+ ⅛	—
Do. 8% Pref.	1	8	8	38/9	—	4 2 6
Edison Swan 1st Pref.	1	7½	7½	30/-	—	5 0 0
Electric Construction	1	3½	7	37/6	—	3 14 8
Enfield Cable Ord.	1	25	25	5½	—	4 9 0
English Electric	1	Nil	Nil	24/6	+1/6	—
Do. Do. Pref.	1	Nil	Nil	27/-	—	—
Ericsson Tel.	5/-	24	20*	2⅜	—	1 16 4
Ever Ready	5/-	35	35	26/0	—	6 14 7
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	35/-	—	3 14 4
Do. Ord.	1	10	15	84/6	—	3 11 0
Henleys	1	30	30	7⅜	—	3 18 8
Do. 4½% Pref.	5	4½	4½	5⅜	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	48/3	—	4 3 0
Lancashire Dynamo	1	5	10	2⅞	—	3 9 7
Siemens Ord.	1	4	6	30/-	—	4 0 0
Telegraph Construction ...	£1	Nil	Nil	30/-	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be numbered and abridged and all subsequent proceedings will be taken

1934

28548 "Electron-multiplying device." Television Laboratories, Ltd. October 7th, 1933. (450138.)

31870. "Electric distant control systems." N. Japolsky. November 6th, 1934. (449901.)

32204. "Electric propulsion of ships." Akt.-Ges, Brown, Boveri & Cie. November 8th, 1933. (450086.)

32340. "Remote control of dynamo-electric generators." Lincoln Electric Co. December 4th, 1933. (450141.)

34484. "Electrical impedance networks." H. Page. November 30th, 1934. (449,949.)

35074. "Method and material for insulating electric cable joints and other enclosed electrical conductors." Callender's Cable & Construction Co., Ltd., and G. M. Hamilton. December 6th, 1934. (450088.)

1935

357. "Electrical signalling systems." Automatic Electric Co., Ltd., T. R. Rayner and G. A. Burns. January 4th, 1935. (449907.)

375. "Thermostats." L. Satchwell. January 4th, 1935. (449908.)

385. "Electric radiators." Limit Engineering Co., Ltd., and A. L. Collins. January 4th, 1935. (450094.)

412. "Short-wave radio receiving systems." L. H. Paddle. January 5th, 1935. (450150.)

492. "Electric light fittings." General Electric Co., Ltd., and J. W. Ryde. January 7th, 1935. (449952.)

546. "Electric insulating materials and a process for obtaining them." Standard Telephones & Cables, Ltd., and A. A. New. January 7th, 1935. (Cognate application 18568/35.) (449955.)

651. "Automatic switches for use in telephone or like systems." Automatic Electric Co., Ltd., and R. N. Saxby. January 8th, 1935. (450019.)

654. "Electric liquid heaters." British Thomson-Houston Co., Ltd., and F. A. Fossey. January 8th, 1935. (450020.)

739. "Dynamos." C. A. V.-Bosch, Ltd., W. H. Glaser and C. J. Douglas. January 9th, 1935. (450098.)

884. "Guards for the contact springs of electric relays." Automatic Electric Co., Ltd., and S. A. Wickerson. January 10th, 1935. (450160.)

1225. "Dielectrics in electrical apparatus." British Thomson-Houston Co., Ltd. January 16th, 1934. (450170.)

1575. "Electric coupling of electric heating, lighting and similar apparatus." A. C. Elliott and A. Cigarini. January 17th, 1935. (450174.)

1624. "Systems for controlling the rate of variation of the magnetism of an electromagnet or electric generator." British Thomson-Houston Co., Ltd. January 17th, 1934. (Addition to 370532.) (450176.)

1836. "Lightning arrestors." A. Sadler (Schiele & Bruchsaler Industriewerke Akt.-Ges. January 19th, 1935. (450178.)

2150. "Electric light fittings or supports." C. E. Forryan. January 22nd, 1935. (449914.)

3050. "Electricity prepayment meters." English Electric Co., Ltd., G. Tilstone and J. F. Donelly. January 30th, 1935. (Cognate application 12997/35.) (450106.)

3463. "High-frequency electrical oscillator arrangements." Marconi's Wireless Telegraph Co., Ltd. February 28th, 1934. (449915.)

5677. "Combined electric switches and plug couplings." Wandsworth Electrical Manufacturing Co., Ltd., and T. Batchelor. February 22nd, 1935. (450026.)

6013. "Direct-reading radio direction-finders." Standard Telephones & Cables, Ltd. May 24th, 1934. (450027.)

6416. "Electron valves." Naamlooze Vennootschap Machinerieen en Apparaten Fabrieken Meaf. May 7th, 1934. (Cognate applications 6417/35, 6418/35 and 6419/35.) (449920.)

7526. "Prepayment meters." Electrical Apparatus Co., Ltd., R. H. Barbour and G. G. Welsh. March 11th, 1935. (449970.)

7703. "Electrical driving apparatus for web-winding machines." C. G. Haubold Akt.-Ges. March 12th, 1934. (Cognate application 7704/35.) (450113.)

8433. "Dynamo-electric machines." G. M. Pestarini. March 18th, 1935. (449924.)

8684. "Demagnetiser of the coil type." H. Humpreys, W. Humpreys, A. Humpreys and A. Humpreys (trading as J. H. Humpreys & Sons). March 20th, 1935. (449926.)

9877. "Electric radiators or heaters." H. H. Berry. March 29th, 1935. (450031.)

10459. "Mechanism for the electrically-effected remote control of rotary parts." H. Simon, Ltd., and J. C. Brian. April 4th, 1935. (449927.)

10997. "Electrical connecting-caps." Ferranti, Ltd., and V. Wrigley. April 9th, 1935. (449929.)

11345. "Work conveyors for electroplating and like apparatus." W. Canning & Co., Ltd., and C. F. Pougher. April 12th, 1935. (450116.)

13471. "Electrodes for high-pressure metallic vapour electric-discharge tubes." W. J. Tennant (Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude-Paz & Silva). May 7th, 1935. (450035.)

13586. "Electric circuits comprising thermionic amplifiers in push-pull." General Electric Co., Ltd., and K. A. MacFadyen. May 8th, 1935. (450036.)

13807. "Methods of reclaiming electric lamps or thermionic valves." A. H. Stevens (Birdseye Electric Co.). May 10th, 1935. (450039.)

13927. "Electric fires or radiators." H. H. Berry. May 11th, 1935. (449932.)

14131. "Electrical time-base circuits." General Electric Co., Ltd., and D. C. Espley. May 14th, 1935. (450041.)

14232. "Electrical connections." General Electrical Co., Ltd., and S. M. Duke. May 15th, 1935. (449934.)

14400. "Manufacture of laminated cores for electrical machines." R. Townend and Metropolitan-Vickers Electrical Co., Ltd. May 16th, 1935. (450042.)

14802. "Rotary electric switches." J. Marr. May 21st, 1935. (450043.)

15746. "Electrolytic condensers." Dubilier Condenser Co., (1925), Ltd. May 31st, 1934. (449936.)

15886. "Fan-cooled dynamo-electric machines." English Electric Co., Ltd., L. Roberts, R. D. Ball and J. Teal. May 31st, 1935. (450045.)

15900. "Control of alternating-current motors." British Thomson-Houston Co., Ltd. May 31st, 1934. (450046.)

16221. "Electrolytic condensers." Plessey Co., Ltd. (P. R. Mallory & Co., Inc.). June 4th, 1935. (449938.)

16910. "Electrodeposition of tin." Sir J. Cambell and W. H. Tait. June 12th, 1935. (450049.)

19285. "Means for covering the joints of casing plates of electrically heated stoves." British Thomson-Houston Co., Ltd. July 5th, 1934. (449981.)

19297. "Radio direction-finder." M. Sandfort. July 5th, 1935. (449982.)

21335. "Wheel operated electric switch for signal or gate shutting means at railway level crossings." S. Satoh and F. Shibutani. July 26th, 1935. (449985.)

21922. "Television radio transmitter." Radio-Akt.-Ges. D. S. Loewe. August 9th, 1934. (450057.)

22919. "Electrical supply equipments." G. M. Pestarini. August 15th, 1934. (450060.)

23507. "Thermionic valve or tube amplifiers and the like." Aktiebolaget Stern & Stern. August 23rd, 1934. (450061.)

27565. "Protectors for electric curling-irons." S. Kallmann. March 13th, 1935. (450202.)

28925. "Dual purpose thermionic tubes." Rogers Radio Tubes, Ltd. November 6th, 1934. (450063.)

31069. "Electric power switches." Siemens Schuckertwerke Akt.-Ges. November 10th, 1934. (Cognate application 31070/35.) (449995.)

34223. "Electric signalling systems." Soc. d'Etudes pour Liaisons Téléphoniques et Télégraphiques à Longue Distance. June 6th, 1935. (449999.)

34786. "High-grade broadcasting with reduced band width." N. Koomans. December 14th, 1934. (450000.)

35215. "Dynamos." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 30th, 1935. (450072.)

35352. "Conducting systems for high-frequency electrical energy." C. Lorenz Akt.-Ges. December 22nd, 1934. (Cognate applications, 35353/35 and 35354/35.) (450073.)

1936

302. "Electron tubes." C. Lorenz Akt.-Ges. January 10th, 1935. (450074.)

446. "Combined power and gear unit incorporating an electric motor." E. C. Holbeche. January 6th, 1936. (450005.)

552. "Electrodes for apparatus for coating articles by sputtering." Electrical Research Products, Inc. April 25th, 1935. (450075.)

1506. "Means for preventing theft or unauthorised removal of electric lamp bulbs." J. A. Brook. January 17th, 1936. (450077.)

1686. "Electric lamps." British Thomson-Houston Co., Ltd. January 18th, 1935. (450078.)

2155. "Electric lamp sockets." General Electric Co., Ltd. January 23rd, 1935. (450007.)

2156. "Electric lamp sockets." General Electric Co., Ltd. February 6th, 1935. (450008.)

2360. "Connectors for tubular cables." Telefunken Ges. für Drahtlose Telegraphie. January 24th, 1935. (450079.)

3978. "Electrolytic condensers." Dubilier Condenser Co. (1925), Ltd. May 31st, 1934. (Divided out of 449936.) (449947.)

4432. "Circuit arrangements for selectively receiving and amplifying modulated high-frequency carrier waves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 13th, 1935. (450081.)

4924. "Electric circuit-breakers." British Thomson-Houston Co., Ltd. February 18th, 1935. (450012.)

7660. "Electric cooking ovens." Moffats, Ltd., and E. S. Smith. March 13th, 1936. (450082.)

10132. "Variable thermionic impedances." Murphy Radio, Ltd., G. B. Baker, and G. F. Hawkins. December 4th, 1934. (Divided out of 34831/34.) (450136.)

15739. "Means for suppressing harmonics in electric transformers." English Electric Co., Ltd., and W. E. M. Ayres. December 5th, 1934. (Divided out of 34947/34.) (450137.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 29th:—

Rulag. No. 569346. Class 8. Electric batteries (not for medical purposes) and cells for electric batteries. No. 569347. Class 13. Electric torches, pocket lamps, and electric lamp and torch cases, all being metal goods.—Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, E.C.1.

Sur Vita; Surprising Vitality (lettering and design). No. 568927. Class 13. Electric lamps (ordinary).—Wartburg Lamps, Ltd., Imperial Works, Perren Street, Ryland Road, N.W.5.

The British Association

An important report is to be presented to Section G of the British Association Meeting at Blackpool on September 10th by Dr. L. G. A. Sims, giving details of the investigations which he has made in response to the B.A. Committee's request concerning the best specification for incremental permeability of iron and steel.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Cinema, High Street, for William E. Willis, Fairwell, Llandaff.
Alcester.—Houses (98); R.D.C. surveyor.
Alperton.—School, Lily Gardens (£18,174); A. & B. Hanson, Ltd.
Banstead (SURREY).—Hospital and convalescent home (£200,000), electrical work; Sir Edward Penton, secretary superintendent.
Barking.—Houses (233), Longbridge estate; Leftley Bros., Ltd. Houses (215) and fire station and quarters; borough engineer. Factory, Abbey Road; W. Warne & Co., Ltd.
Bedale (YORKSHIRE).—Houses (56); R.D.C. surveyor.
Beverley.—Houses (42), Mill Lane; Whiteing & Reynolds, architects.
Birmingham.—Factory, Granville Street; W. Bishop, builder, York Road. Extensions to Reynolds Tube Co., Ltd., Tyseley.
Bognor Regis.—Houses (50) and bandstand shelter, &c. (£38,300); U.D.C. surveyor.
Bournemouth.—Public hall, Branksome (electrical work); Charles H. Heathcote, architect, Branksome Park.
Bradford.—Maternity building, St. Luke's Hospital (£35,750); Corporation Health Committee.
Bristol.—Factory, Hotwells, for the Scottish Western Manufacturing Supply Co., Ltd.
Castleside (Co. DURHAM).—Houses (45) for Robert Scott, Wharnley Burn Farm.
Chatham.—Alterations and additions to Glencoe Road Council infants' schools; R. L. Honey, architect, Town Hall.
Chelmsford.—Council offices, Rainsford House site; Cordingley, architect. Development of Melbourne Park estate; H. J. Hewlitt, surveyor.
Chesterfield.—Special school, Bramling House, for E.C.
Coventry.—Houses (1,000) and shopping centres, Caludon Castle estate, Ansty Road and Binley Road, Binley Bridge; A. E. Newey, Ivy Cottage, St. Nicholas Street. Aero engine factory adjoining the Standard Motor Co.'s works, for the Air Ministry (£650,000).
Cumberland.—Senior schools, Silloth and Wigton; director of education, Carlisle.
Doncaster.—Grammar school; J. R. Leathart, Gordon Square, London, W.C.1.
Dorset.—County offices, Colliton Park, Dorchester (£175,000); county surveyor.
Douglas (I.O.M.).—Extensions to King William College; J. Cowle & Son, builders, St. George's Street.
Easthampstead.—Houses (40), Winkfield; Frederick Sainsbury, architect, 154, Friar Street, Reading.
Edinburgh.—Houses (88), Gorgie Road; city architect.
Essex.—Technical college, Walthamstow (£170,157); County architect, Chelmsford.
Exeter.—Houses (59); city architect. Rebuilding of John Stocker school (£20,500), for E.C.
Fishburn.—Church, for the Methodist trustees; A. Johnson, secretary, Trimdon Station.
Fort William.—Houses (44); A. T. Scott, borough surveyor, Cameron Square.
Gateshead-on-Tyne.—Houses (21), Kitchener Terrace, &c.; L. Ather, builder, Durham Road, Low Fell.
Gloucester.—Houses (70); R.D.C. surveyor.
Halesowen.—Houses (70); U.D.C. surveyor.
Harrow Weald.—School, Hibbert Road (£27,334); Y. J. Lovell & Son.
Hastings.—Cinema (electrical work), Cambridge Road, for the Union Cinematograph Co., Ltd.
Hounslow.—Cinema, for the Associated British Cinemas, Ltd., 346, Kilburn High Road, London, N.W.6.
Hull.—Buildings for Riley High school, for E.C. Church, East Hull estate; Rev. J. B. Davies. Factory, Stoneferry estate; Woodware Manufacturing Co.
Ilford.—Houses (189), Hanover Gardens, &c.; Davis Estates, Ltd., 346, Kilburn High Road, London, N.W.6.
Inverness.—Milk factory, Greig Street, for the North of Scotland Milk Marketing Board; clerk.
Irish Free State.—(Co. WEXFORD).—Houses, Ferns and Bunclody, for the Wexford Board of Health; O'Sullivan & Jordan, architects and engineers, 104, Grafton Street, Dublin. (KANTURK, Co. CORK).—Vocational schools, for the Vocational E.C., 27, Tuckey Street, Cork; D. J. Tierney, architect, 85, South Mall, Cork.
Irlam.—Houses (52); U.D.C. surveyor.
Kidderminster.—Houses (65), near Hoo Road, for T. P. Smith, Ltd.
Kirkcudbrightshire.—County buildings, for C.C.; county architect, Kirkcudbright.
Kirkham (LANCS).—Extensions to Grammar school (£20,000); Board of Governors.
Lanchester (Co. DURHAM).—Central hospital (£160,000), for the Joint Hospital Board; clerk.
Leicester.—School, South Charn Wood (£19,137); for E.C.
Leominster.—Houses (20); borough surveyor.
Lewes (SUSSEX).—Houses (36), Caburn Crescent, for Ringmer Building Works, Ltd.
Lichfield.—Houses (22); G. T. Roberts, builder, Brownhills.
Liverpool.—Rebuilding after fire the Royal Court Theatre, Roe Street and Charlotte Street, for Arthur Roberts Theatres Co., Ltd.; T. Wainwright & Sons, architects, 11, Lord Street.
Llandilo.—Carbide factory, Brynamman, for the British Oxygen Co., Ltd., Angel Road, London, N.18.
London.—(FOREST GATE).—Cinema, Romford Road, for the Odeon Theatres, Ltd.; Harry W. Weedon, architect, Birmingham. (OXFORD STREET).—Rebuilding of department stores, for John Lewis, Ltd., W.1. (VICTORIA DOCKS).—Extensions to flour mills, for Joseph Rank, Ltd., Premier Mills, Victoria Docks, E.16.
Lowestoft.—Omnibus station for the Eastern Counties Omnibus Co., Ltd.
Manchester.—Buildings, for High School for Girls, Rusholme (£50,000); Governors. Extensions to Central High School for Boys; Tinker & Young, Ltd.
Mansfield.—Extensions to works, Clifford Street; G. E. Neville & Son, Ltd.
Market Drayton.—Houses (35); R.D.C. surveyor.
Middlesex.—Police station, London Road, Twickenham, for C.C.; police architect, Tufton Street, London, S.W.1.
Mirfield (YORKSHIRE).—Cinema, electrical work; Fairhurst & Poppleton, architects, Oddfellows' Hall.
Monmouthshire.—Senior school, Cross Kays, Gwent; director of education, Newport.
Nottinghamshire.—Extensions to Mansfield Technical College (£60,000); director of education, Nottingham.
Olton (WARWICKSHIRE).—Houses (250) new estate between Lode Lane and Lyndon Road; Neale & Aldridge, surveyors, 33, Newhall Street, Birmingham.
Ormsby (YORKSHIRE).—Houses (24), Orchard Way, for W. A. King & Son.
Penshaw (Co. DURHAM).—School (200 places); R. P. Howard, builder, 55, Grange Road, Newcastle-on-Tyne, 4.
Petersfield (HAMPSHIRE).—Houses (36); R.D.C. surveyor.
Port Glasgow.—Houses (272), Woodhall estate (£100,128); James Murray, burgh surveyor, Anderson Street.
Rochester.—Police headquarters; city surveyor.
Romford.—Houses (50); U.D.C. surveyor.
Romsey.—Senior school (£23,316); director of education.
Shoreham-by-Sea (SUSSEX).—Houses (76); U.D.C. surveyor.
Slough.—Shops, offices and flats, for Slough Development Committee.
South Shields.—Houses, Dean Road and Reed Street; G. Thornton & Sons, builders, Morpeth Avenue. Public library behind the Town Hall; borough engineer.
Sowerby Bridge.—Houses (72); U.D.C. surveyor.
Stafford.—Houses (100), Tillington estate; borough engineer.
Stalham (NORFOLK).—Houses (52); A. L. Taunton, architect.
Stamford (LINCOLNSHIRE).—Extensions to town hall and municipal offices; Frederick R. Ryman, borough engineer.
Stanmore.—School, Abercorn Road (£24,943); J. Stewart & Sons (Tottenham), Ltd.
Staveley (DERBYSHIRE).—Houses (20); U.D.C. surveyor.
Stockport.—Cinema, Buxton Road, Mile End, for E. H. Burns, Electric Theatre, Cheadle; C. Hartley, architect, 128, Buxton Road, Great Moor.
Stockton-on-Tees.—Houses (100); G. P. Stainsby, architect.
Stoke-on-Trent.—Houses (1,494); city surveyor.
Stourbridge.—Houses (100), Hodge Hill, Wollescote; borough surveyor.
Stratford-on-Avon.—Cinema, Bridge Foot, for the Stratford Picture House Co.
Sunderland.—Alterations to Black's Regal Cinema; W. Norman, builder, West Lane, Chester-le-Street.
Swadlincote.—Houses (48); T. Barker & Sons, builders, Loughborough. Public offices and Council chamber (£31,742); U.D.C. surveyor.
Teddington.—Rebuilding the Savoy Cinema; Savoy Co.
Torquay.—Houses (32), Shipley Park Road; J. Lloyd.
Tottenham.—Houses (134) and flats, Weir Hall estate; borough engineer.
Tunbridge Wells.—Houses (162) and civic centre (£100,880); borough surveyor.
Tynemouth.—Houses (20), Brookland Terrace; H. W. Kaye. Houses (152), Ridges estate (£41,465); borough engineer. School, Ridges estate (£15,654); J. R. Rutherford & Sons, Ltd. Alterations to Albion Cinema; Albion Cinema Co., Ltd.
Ventnor.—Houses (40); U.D.C. surveyor.
Walsingham.—Catholic church; Rev. Father B. S. James.
Warwickshire.—Extensions to mental hospital, with electrical work, for C.C.; county architect, Leamington Spa.
Washington (Co. DURHAM).—Cinema, Fatfield Road, for Mrs. A. P. Brown; A. J. Lamb, architect, 16, Dean Street, Newcastle-on-Tyne.
Wednesfield.—Houses (24); U.D.C. surveyor.
Wembley.—Houses (250); U.D.C. surveyor. Estate development, Kenton Road; Comben & Wakeling, Ltd., 25, Court Par, North Wembley. Two schools, Hay Lane and Kenton Road; R.C. Authorities.
West Ashford (KENT).—Houses (52); R.D.C. surveyor.
West Hartlepool.—Town hall (£130,000); borough engineer. Plate mill; South Durham Steel & Iron Co.
West Riding.—Secondary school, Adwick-le-Street, for County E.C.; education architect, Wakefield. Senior school and technical institute, Bingley; director of education, County Offices, Wakefield.
Whitehaven.—School (500 places), for Borough E.C.; borough surveyor.
Wincanton.—Houses (28); R. Earnshaw, architect.

New Mexican Power Stations

Cia. Hidro-Electrica del Amacuzac has erected a power station with a total capacity of 5,000 h.p. for the purpose of supplying the centre of Mexico City with energy for power and lighting. The generators, motors and cable needed have for the most part been supplied by German and Swiss manufacturers. It is proposed to erect a further station of 150,000 h.p. capacity.